RUSS OLSON VOLUME 2A

TWIN CITY RAPID TRANSIT CO.

CORPORATE HISTORY

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Financial and Ridership Information

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CONTENTS OF FRONT POCKET

Thomas Lowry statue
Karl Bitter 1915
Virginia Triangle Henn & Lyndale
Moved 1967 (I94 Construction)
to Smith Triangle Henn @ 24th

ERJ Aug - Dec 1915

Cripple Creek Coal Co.

Drift mine, located 2 miles southwest of Bryant, Illinois. 1st month of operation was November, 1917.

Thru 6-30-1918 produced 22,832 Tons, 152 days of operation.

Loaded on cars for shipment (CB&Q)	17,382 Tons
Sold to railroad companies	4,950 tons
Sold to local trade	500 Tons

Minneapolis

Hennepin County organized 1852
City (~~Town?~~) of Minneapolis inc. 1856
St. Anthony village detached from
Ramsey County and added to
Hennepin County 1856
Minneapolis and St. Anthony combined
1872

Minneapolis Bridge Company (Franklin
Steele) opened the suspension
bridge 7-4-1855

City of Minneapolis

Year	area in Sq Mile	Population
1872	12.53	21,014
1880	12.53	46,887
1881	12.75	63,342
1883	34.80	96,272
1885	35.30	129,201
1887	53.29	143,423
1927	58.79	442,300

GENERAL HISTORY

TWIN CITY RAPID TRANSIT CO.

MINNEAPOLIS and ST.PAUL

MINNESOTA

SECTION 1

CORPORATE HISTORY

MINNEAPOLIS STREET RAILWAY

There are various accounts, depending upon which history books one reads, as to the very earliest horsecar operations.

1. The Minneapolis Horse Rail Road Company was incorporated in December, 1867, by Dorilus Morrison (the city's first mayor), Benjamin S. Bull, Frederick A. Gilson, William S. Judd and Godfrey Scheitlin. Late in 1867 the company began to lay track on 2nd St. S. from Hennepin Ave. to Cedar Ave.. Supposedly two horsecars and one steam motor were purchased from an Ilion, New York, firm. It is uncertain whether operations were ever begun. An 1871 newspaper editorial stated that the city's only streetcar was located on 2nd St. near the St.Paul & Pacific Railroad tracks, deposited so it could gather dust out of the way.

2. In 1872 Col. William S. King operated six blocks of track on 3rd St. from 4th Ave. N. to 2nd Ave. S. using two horsecars.

3. Col. King constructed a line during 1873 on 2nd St. from Nicollet Ave. to Cedar Ave.. It was not known whether any cars were actually operated but two horsecars had been purchased and were abandoned in a ditch near the Cedar Ave. end of the line.

4. Before 1872 a single track about eight blocks long connected the Northern Pacific Railway yards with the Milwaukee & St.Paul Railway yards at 4th Ave. S. with one mule car providing service.

5. A wooden track was laid on Hennepin Ave. across the suspension bridge in 1874 and one small car operated for a short period of time.

6. The Minneapolis Street Railway was incorporated June 24, 1873, by Dorilus Morrison (mayor and sawmill operator), Col. William S. King (more about him later), W. W. Eastman (lumberman), Paris Gibson (proprietor of North Star Woolen Mill), R. B. Langdon (railroad contractor), W. W. McNair (lawyer and real estate dealer), R. J. Mendenhall (banker and florist), J. C. Oswald (liquor dealer), W. D. Washburn (flour mill operator) and W. P. Westfall (banker). In July 1873 a steam motor was purchased at Ilion, New York, and a track laid on 2nd St. from Hennepin Ave. to nearly Cedar Ave. The enterprise collapsed due to the financial panic of 1873 and the track was removed without ever having been used. After abandonment all of the original incorporators with the sole exception of Col. King deserted the street railway enterprise.

The factual history of the formation of the Minneapolis Street Railway is somewhat different than that related in the foregoing paragraph. The incorporation date and incorporators' names are correctly reported in the previous paragraph. However subsequent events occurred because of financial complications involving Col. William S. King's real estate investments.

Col. William S. King

At age 30, in the summer of 1858, King moved to Minneapolis from Cooperstown, New York, where he had been active in Republican politics and published a political newspaper. He purchased a printing press and in the spring of 1859 commenced publishing a newspaper, the STATE ATLAS. His dynamic editorials soon got him deeply involved in the Minnesota Republican Party. In 1867 the STATE ATLAS was merged into the MINNEAPOLIS TRIBUNE. (He supposedly became a large stockholder in the St.Paul PIONEER PRESS, and one of the principal owners of the MINNEAPOLIS JOURNAL.) When the Civil War began he moved to Washington D.C. and was appointed postmaster of the House of Representatives, which influential position he held until 1873, with the exception of one two-year term.

King was involved in the organization of the Northern Pacific Railway in 1869, establishment of the Minnesota State Fair, and organization of the Lakewood Cemetary Association in 1871.

Meanwhile he also had found the time and resources to acquire a large tract of choice real estate. He had maintained an avid interest in the farm life he led as a child. He began acquiring land that lay around Lakes Calhoun and Harriet. By 1873 he owned 1,400 acres, acquired at prices ranging from $50 to $125 per acre, heavily mortgaged at interest rates of 10% and up. The area was originally half timber and half prairie land. He named it Lyndale Farm. A large farmhouse and huge barn with stables were built in 1870 near 39th St. and Bryant Ave. S. The farm was stocked with a large number of blooded cattle, horses, sheep and hogs, among them choice English breeds. Annual cattle sales were held.

Lyndale Farm was located well outside the Minneapolis city limits. A perceived need for public transportation linking the farm to the Minneapolis population was cause for the organization of the Minneapolis Street Railway in 1873. However there was very little investment cash available in Minneapolis at the time. King's first and second wives were from Ilion, New York, location of the Remington Arms Company. His first wife was the sister-in-law of Eliphalet Remington III. By 1873 the Remington enterprises were free of debt and had amassed considerable cash. Their Remington Agricultural Works in 1872 had produced a steam-powered streetcar and put it in service on the newly completed Frankfort and Ilion Street Railroad, linking Herkimer, Mohawk, Frankfort and Ilion by horsecar. King appealed to and received financial support from Philo Remington, one of the three sons of the founder of the Remington Arms Company.

On August 13, 1873, one Philo Osgood "and a group of his friends" subscribed for most of the capital stock of the Minneapolis Street Railway. These first stockholders were: Philo Osgood 2,490 shares, William S. King 5 shares, and S. E. Neiler (Cashier of the one-year old Northwestern National Bank, Minneapolis) 5 shares, total 2,500 shares. Philo Osgood was the manager of an Ilion hotel owned by the Remingtons and was probably serving as the agent of the men who actually purchased the stock. While capitalized at $250,000 (2,500 shares @ $100 each), only a 5% assessment or $12,500 was immediately paid in. A Remington steam streetcar was shipped to Minneapolis, tested and demonstrated for several days on the Milwaukee & St.Paul Railway tracks, then shipped back to Ilion.

> William Baxter of Ilion was associated with the Remington Arms Co. which produced his portable compact steam engine, the first compound engine in American railway service. A test car was built in the fall of 1872. The engine was mounted on a 30-passenger horsecar with a vertical boiler on the front platform, the engine being directly connected to the wheels without benefit of gearing. The 5"x8"x12" cylinders were so arranged that the engine could operate either as simple or compound. When extra power was required a transfer valve was opened to direct high pressure steam directly into both the low and high pressure cylinders. This test car eventually entered service on the Worcester & Shrewsbury Railroad (which connected Worcester with a lake resort) and remained in service on that line until almost 1890. The steam powered streetcar demonstrated in Minneapolis during 1873 was the fifth of its kind, the one built by the Remington Agricultural Works (E. Remington & Sons) in 1872 for the Frankfort & Ilion Street Railroad. The car weighed 11,000 pounds, had the water tank in the rear and the boiler in the front, seated 24 persons plus 51 standing, was capable of 15 to 20 m.p.h. speed, and cost $5,000. When it operated in Minneapolis both ends were lettered "MSRR Co. No.1".

According to Goodrich Lowry's book, STREETCAR MAN, the Minneapolis St. Ry. began construction of a very modest type of track which probably extended a mile on Third St. from 4th Ave. N. to as far as 8th Ave. S. In the fall of 1873 the Philadelphia banking house of Jay Cooke & Company collapsed while financing construction of the Northern Pacific Ry. The resulting national financial panic especially affected Minneapolis as it served as field headquarters for the N.P. Ry. The Minneapolis St. Ry. tracks were torn up before they were used.

As the recession continued it seriously affected Col. King's finances. During 1875 creditors had attached most of his real estate. King appealed to Philo Remington for financial assistance. While the Remington enterprises were also experiencing financial difficulties, an inspection trip to Minneapolis was made by Remington's lawyer, Judge Amos H. Prescott, and banker F. C. Shepard, Cashier of the Ilion National Bank. They were hosted in Minneapolis by King and his lawyer, Thomas Lowry. The result was that Prescott and Shepard formed a favorable impression of Minneapolis and the value of Col. King's property.

Thomas Lowry

Thomas Lowry was born February 27, 1843, in Logan County, Illinois. Upon completion of his education as a lawyer and admittance to the bar, he moved to Minneapolis in the summer of 1867. He established a law office in rented rooms over a store in a small wooden structure located on the corner of 2nd St. and Nicollet Ave. A period of prosperous activity in the real estate market was in progress so he took on the purchase and sale of real estate as a side-line. Soon he was more real estate dealer than lawyer. Possibilities of metropolitan greatness grew in his imagination and he began purchasing lots and acres in every direction. Gradually he became involved in financing through eastern investors. In 1874 he built a mansion on seven acres of choice high ground on the corner of Hennepin and Groveland Avenues (later known as Lowry Hill) at a cost of $40,000.

On June 10, 1875, Lowry headed east on the same train to Chicago as Prescott, Shepard and King and Lowry arranged to meet with them in Ilion a few days later to work out an arrangement for building the Minneapolis St. Ry. Apparently Lowry had grasped the value of street railway transportation as a means of real estate development.

On July 9, 1875, the Minneapolis city council passed an ordinance granting the Minneapolis St. Ry. a franchise for the construction and operation of a street railway system effective for 50 years from July 17, 1875. The ordinance provided for two routes, the first to be completed within four months from the date of passage, and the other within one year. A meeting of the company directors was also held July 9, 1875, at which the following officers were elected: Philo Osgood, President; Thomas Lowry, Vice President; William S. King, Secretary; and James Tuckerman, Treasurer and General Manager. The re-organized corporation was capitalized at $250,000 (2500 shares at $100 par value) and subscribed for as follows:

Mrs. Carrie M. King (Col. King's wife)	1,000 shares
Philo Osgood	250 shares
Amos H. Prescott	300 shares
Floyd Shepard	500 shares
James Tuckerman	350 shares
Thomas Lowry	100 shares
	2,500 shares

Mrs. King's stock, with the other King assets, was pledged to Philo Remington, and the other stockholders except Lowry, were Remington associates. James Tuckerman moved from Ilion to Minneapolis to assume the duties of General Manager. A stock assessment of $20 per share provided an initial working capital of $50,000.

On July 9, 1875, the Minneapolis city council passed an ordinance granting Minneapolis St. Ry. a franchise for the construction and operation of a street railway system effective for 50 years from July 1, 1873. (Another source states the effective date was July 17, 1875. The ordinance provided for two routes, the first to be completed within four months from the date of passage, the other within one year. A meeting of the company directors was also held July 9, 1875, at which the following officers were elected: Philo Osgood, President; Thomas Lowry, Vice President; William S. King, Secretary; and James Tuckerman, Treasurer and General Manager.

The first horsecar line was completed and opened for service September 2, 1875, which linked the principal railroad depot with the University of Minnesota and passed through the heart of the city. Service was established on a fifteen minute headway from 5:00 a.m. until 11:00 p.m., the hour the Pence Opera House and Market House entertainment activities were completed for the evening. This headway required five horsecars; six horses were needed for each car operated, working in relays during the operating hours. Speed was limited to six miles per hour by the franchise ordinance.

As the financial depression continued, Colonel King's financial condition steadily worsened. He was forced to sell most of his interest in MSR to those whom it had been pledged as security for his indebtedness. During 1877 his 40% interest was reduced to 10%. The 30% was transferred, 5.6% to Stephen Bowen, Boston, Mass., and 24.4% to F. D. Robison, Cleveland, Ohio. The latter interest was subsequently changed to C. H. Hathaway & Co., and still later to Hathaway & Robison. On October 31, 1877, Lowry, acting as King's lawyer, filed a petition in bankruptcy. On April 8, 1878, King's bankrupt estate, the principal asset of which was Lyndale Farm, was sold to Philo Remington.

It was at this time that Lowry formed a group of Minneapolis men to buy a controlling interest in MSR. This was accomplished through A. G. Dickerman and Robert Innes. Innes was the Minneapolis agent for Philo Remington. 1400 shares were acquired by July 2, 1878, mostly in exchange for Minneapolis real estate. Lowry held 1,340 shares, with 10 shares each by W. W. McNair (one of the original incorporators), Clinton L. Morrison (son of Dorilus Morrison), T. J. Buxton (Cashier of the City Bank), H. M. Carpenter (paper manufacturer), T. F. Andrews, and Charles H. Prior (division superintendent, Chicago, Milwaukee & St.Paul Ry.). On July 2, 1878, a new board of directors was elected and the following officers: Thomas Lowry, President; H. M. Carpenter, Vice-president; T. J. Buxton, Treasurer; Calvin G. Goodrich, Jr., Secretary. (Calvin Goodrich was Lowry's 22-year old brother-in-law.)

The 1879 annual stockholders meeting is unclear as to stock ownership. By the July 6, 1880, annual meeting the remaining 1,100 outside shares had been acquired. Lowry held 1,937 shares, McNair and C. L. Morrison 280 shares each, and W. W. Herrick (real estate dealer), C. G. Goodrich, George H. Morrison (brother of C. L.), one share each.

The MSR board of directors September 1, 1880, authorized an increase in the capital stock from $250,000 to $1,000,000. As the corporate by-laws required payment of 5% of the par value at the time of subscription for the stock, the by-laws were changed to allow the stock to be issued as "full paid stock" due to the "increased value of rights and franchise". On September 23, 1880, a bond issue of $400,000 was authorized, of which $150,000 was earmarked to pay existing indebtedness. At a board of directors meeting April 13, 1881, a resolution was passed that because of MSR's current good financial condition but previous financial embarassment, an entry in the accounting records be made entering a liability to Lowry in the amount of $258,273.50 owed since 1875 for cash advances, legal services, property conveyed, travel expenses for eastern trips to establish credit and sell bonds, and personal endorsement of MSR notes payable. During August, 1881, the additional stock was issued resulting in Lowry holding 9,984 shares, with four shares each by C. L. Morrison, McNair, Herrick and Goodrich. Lowry was President;, Morrison, Vice-~~ident~~; Goodrich, Secretary; and Herrick, Treasurer.
president

ST.PAUL STREET RAILWAY

On March 2, 1853, an act of the state legislature created in perpetuity the St.Paul and St.Anthony Railroad. Nothing was accomplished and the corporation was revived on March 4, 1868, and again on February 29, 1872 but under the new name of St.Paul Street Railway Company. The SPSR was organized by J. W. Bass, J. C. Burbank (J. C. Burbank & Company, proprietors of the Minnesota Stage Company in 1864), H. L. Carver, William Dawson, Warren H. Dean, Girard Hewitt, W. R. Marshall, Lafayette Shaw, Horace Thompson, John Wann and W. S. Wright. The first franchise from the City of St.Paul had been received January 8, 1872.

Capital stock subscriptions were received June 5, 1872. Each of the incorporaters except Lafayette Shaw subscribed for 300 shares each. In addition, William Crooks (Chief Engineer of the St.Paul & Pacific Railroad) subscribed for 50 shares. Officers elected were: J. C. Burbank, President; John Wann, Vice-president; William Dawson, Treasurer; and H. L. Carver, Secretary and Superintendent. The first horsecar line began operation July 15, 1872. On July 20, 1872, Carver sold his interest to and was replaced as an officer by W. R. Marshall.

On November 22, 1872, Marshall purchased the Burbank, Hewitt, and Thompson interests giving him 1,500 shares of the 3,050 shares outstanding. W. H. Dean purchased the Wann, Wright, and Bass interests giving him 1,250 shares. The corporate by-laws were then changed reducing the Board of Directors from nine persons to five. Elected were: W. R. Marshall, President; W. H. Dean, Vice-president; J. Oscar Dean, Secretary; William Dawson, Treasurer; and Lafayette Shaw. The disposition of William Crooks' shares was not stated. As payments became required for the capital stock subscriptions, stock ownership continued to change. In August, 1873, [redacted] both Deans resigned, being replaced by Nathaniel P. Langford as Vice-president and Benjamin S. Cook as Secretary and General Manager. In September, 1873, William Dawson resigned, replaced by Newton Bradley. About 1874 mortgage bonds in the amount of $55,000 were issued, it being claimed that $110,000 had been invested in the system.

The property was leased to a partnership of Lafayette Shaw and W. R. McComb for a term of three years from August 1, 1874. Rental the first year was $600 per month; during the second and third years 12% on the actual investment. Effective August 15, 1875, the partnership was dissolved; McComb assigned his interest to Shaw who had negotiated a new lease for a term of five years from August 1, 1875, at an annual rental of $18,400.

Financial difficulties were encountered during 1876. On October 10, 1876, Langford, Bradley and Cook resigned as Directors. They were replaced by Erasmus D. Whiting, Smith Ellison and Orlando Farrell, probably representing the bondholders, who were all eastern investors. Payment of interest on the mortgage bonds was defaulted in April, 1877. The bondholders instituted foreclosure proceedings. At a sheriff's sale on September 28, 1877, the property was purchased by Thomas Cochran Jr. as trustee under the mortgage. The property consisted of 3.75 miles of track, two horsecar barns, 15 horsecars, 34 horses, six mules, two snow plows, and three double-canvas-top sleighs.

ST.PAUL CITY RAILWAY

The first Board of Directors of SPCR was elected October 30, 1877. From New York: Alfred H. Porter, President; William H. Phillips, Vice-president; William G. Dominick, Secretary; from St.Paul: James R. Walsh, Treasurer; and Henry J. Horn. The SPSR was incorporated in Minnesota November 16, 1877. Mr. Cochran operated the company until completion of the foreclosure proceedings in October, 1878, placed the title to the property in the bondholders. On November 4, 1878, Horn resigned and was replaced by Thomas Cochran Jr.; James Walsh was appointed General Manager. Directors' meetings were held at the office of Dominick & Dickerman, Bankers and Brokers, 66 Broadway, New York City.

On December 6, 1878, the bondholders exchanged their bonds and interest coupons for common stock. 660 shares of $100 par value stock were issued for the 55 bonds and the four interest coupons on each bond. Additional stock was sold to the existing stockholders to pay for the cost of building the St.Anthony Hill horsecar line during 1879: two shares of stock for each bond. Thus an additional 110 shares of stock were issued making the total outstanding stock 770 shares or $77,000.

Mr. Walsh succeeded in making the operation profitable; it was earning a 7%-8% return on the $77,000 investment. However when one of the directors traveled to St.Paul to inspect the property in the fall of 1879 he reported that the original rails had been too light and were worn out, while the ties were decayed "almost to punk".

A reconstruction and expansion program during 1880 was financed by issuing for cash an additional 730 shares of stock, or $73,000. A total of 1500 shares of stock was then outstanding. As of January 4, 1882, there were 30 stockholders, located in the following states. New York, 22 persons, 1344 shares; Connecticut, 4 persons, 110 shares; Minnesota, 3 persons, 26 shares; and Kentucky, 1 person, 30 shares. The Minnesota stockholders, all of St.Paul, were: J. F. Alexander, 10 shares; Charles Boardman, 10 shares; and James R. Walsh, 6 shares. Thomas Cochrane Jr. held 46 shares but with a New York address. When the actual cost of the improvements turned out to be $85,000 the SPCR had to borrow $12,000 from one of the stockholders.

Outstanding stock now amounted to $150,000 and the 1880 net profit of $9,000 was only about half of the 12%-14% return that had been forecast. In 1881 the SPCR was forced to build a single track line on Rice St. to prevent a competing company from beginning construction, and found it impossible to declare the semi-annual dividend payable in August.

Thomas Lowry's reasons for becoming involved in St.Paul are unknown. On February 11, 1882, a change in ownership of SPCR took place. The new stockholders were:Thomas Lowry; Francis B. Clarke, President, Northwestern Mfg. & Car Co., Stillwater (an 1882 re-organization of Seymour, Sabin & Company); Herman Greve, real estate dealer; William R. Merriam, Vice-president, Merchants National Bank; and Ansel Oppenheim, investment broker. Each of the five purchased 300 shares of stock (20% interest). The purchase price was $165,000 for the 1500 shares of stock plus the liability for the $12,000 note, a total of $177,000. Clarke was elected President; Greve, Vice-president; and Merriam, Secretary-Treasurer.

The first action of the new Board of Directors was to authorize Lowry to negotiate a first mortgage loan of $200,000 with provisions to borrow an additional $300,000 for future construction. On June 24, 1882, the Directors voted to increase the authorized capital stock from $150,000 to $1,000,000 to be issued as "full paid stock", and voted to pay $177,000 to the five new stockholders as compensation for the time and energy they had devoted to reorganizing and acquiring the company. Thus the new loan reimbursed the new stockholders for the cost of their stock.

By January 8, 1883, Greve and Oppenheim had reduced their holdings by 75 shares each, these 150 shares being transferred to Arnold Kalman, a business associate of theirs. At the annual Board of Directors meeting January 15, 1883, the minutes noted "The road having been operated at a loss, the matter of dividends was not brought up." At a July 6, 1883, stockholders meeting, Clark, Greve and Oppenheim resigned as Directors and were replaced by C. G. Goodrich and C. L. Morrison. Directors and officers elected at this meeting were: Thomas Lowry, President; W. R. Merriam, Vice-president and Treasurer; H. W. Pearce, Secretary, C. G. Goodrich, C. L. Morrison, and Col. Alvaren Allen (owner and proprietor of Merchant's Hotel, St.Paul).

MSR/SPCR: COMMON OWNERSHIP AND MANAGEMENT

Funds needed to finance SPCR new construction after the 7-6-1883 stockholders meeting were initially obtained by transfering some of the recently issued capital stock to Boston investors. As of January 14, 1884, Lowry held 1,666 shares, Calvin M. Winch of Boston was Vice-President and held 4,999 shares, Merriam was Treasurer and held one share, Goodrich and Morrison each held 1,666 shares, and unidentified persons held two shares, for a total of 10,000 shares. Volney S. Ireys of Minneapolis was Secretary. A mortgage bond issue dated April 1, 1884, was delayed for unstated reasons until October 1, 1884. Apparently some proceeds of this bond issue were used to repurchase capital stock. As of April 1, 1885, Lowry held 6,668 shares, Goodrich and Morrison held 1,666 shares each. John H. Randall (General Ticket Agent, First Division St.Paul & Pacific Railroad) and A. Z. Levering (Lowry's personal assistant), Secretary, were elected Directors.

The significance of the September 15, 1886, date is much different than related in other historical references. As related in the foregoing paragraphs Lowry had been in control of SPCR since 1883. According to the corporate minutes, the Directors of each company had decided during early 1886 that it was necessary to increase the capitalization of each from $1,000,000 to $5,000,000 to finance continued improvements and expansion. Boston was the primary source of risk capital in the 1880's. Lee Higginson & Company was the leading investment house in Boston and was involved in the financing of the Chicago, Burlington & Quincy Railroad. Charles Fairchild, an active partner of Lee Higginson & Co. had become a good friend of Thomas Lowry. Lowry entered into an agreement with Lee Higginson & Co., dated August 10, 1886, that provided for the purchase of this additional capital stock by Charles Fairchild and other clients of the firm, both in the east and locally. Lowry also agreed to sell some of his existing capital stock. The agreement also provided that management would remain under control of local persons and that Lowry's policies would be continued. Calvin Goodrich and Clinton Morrison were also parties to the agreement insofar as SPCR was concerned. The formalization of the transaction was to occur between September 1st and 12th, 1886.

The necessary resolutions to increase the authorized capital stock were approved during August, 1886. In each company the stock was to be issued as "fully paid stock to existing stockholders in lieu of dividends and compensation for services". The $4,000,000 increase on each company's books was charged to a property account titled "Franchise". After issuance of this additional capital stock, the total holdings were:

MSR: Lowry 49,920 shares; Morrison, Goodrich, Herrick and Martin B. Koon (judge and lawyer who replaced W. W.McNair after his death in May 1886) 20 shares each.

SPCR: Lowry 33,340 shares; Goodrich and Morrison 8,330 shares each.

The only immediate changes involved SPCR. Morrison resigned as Treasurer and Director, being replaced by W. R. Merriam as Treasurer and Thomas P. Wilson as Director. John H. Randall resigned as a Director, replaced by D. C. Shepard (D. C. Shepard & Co., a railroad contractor which built most of the StPM&M Ry. extensions; a close friend of James J. Hill).

During 1886-1887 Lowry had become financially involved, together with James J. Hill and Charles A. Pillsbury, with the Minneapolis, Lyndale & Minnetonka Railway which operated steam motor lines from downtown Minneapolis to Lake Harriet, Lake Minnetonka and Minnehaha Falls. These three persons held the mortgage bonds and unsecured debt of the ML&M Ry. The ML&M Ry. proposed to issue $1 million in 30 year first mortgage bonds effective April 1, 1887, to pay off the existing indebtedness and finance improvements required by a recent Minneapolis city ordinance. MSR agreed to guarantee the interest payments to make the bonds marketable. As of April 1, 1887, the property and equipment of the ML&M Ry. were leased to MSR for a period of thirty years. Calvin Goodrich was appointed General Manager. Records indicate that new mortgage bonds were issued in the amount of $620,000 which refunded the original bond issue and repaid the unsecured debt.

As a result of the publicity generated by the installation of cablecar systems in the larger cities of the nation, a joint delegation of representatives from the Minneapolis and St.Paul city councils visited Baltimore, Boston, Cleveland, New York and Philadelphia during 1887 at the expense of MSR and SPCR to investigate the best systems of cable railways. The St.Paul city council subsequently pressured SPCR to use cablecars to climb the hilly terrain out of the business district thereby gaining more direct and less roundabout line routings. The Selby Avenue line was completed in December, 1887, and the East 7th Street line in June, 1889. The cost to SPCR was staggering: to cover construction costs and refinance existing debt, cable consolidated mortgage fifty-year 5% bonds in the amount of $3,708,000 were issued. In 1937 $2,208,000 was paid off but the remaining $1,500,000 was extended over ten years with $150,000 to be paid off each year. The East 7th Street line had been electrified in 1893 and the Selby Avenue line in 1898.

As cash was needed to finance construction, stock was transferred according to the agreement with Lee Higginson & Company, increasing the eastern stockholdings. Such changes were more rapid and drastic in SPCR due to the expensive cablecar line construction and lesser profitability of that company. The corporate minute books for both MSR and SPCR reflect these changes which were numerous and complex. The most significant are summarized in paragraphs (1) through (4) following.

(1) Officers and Directors as of January 1, 1888:	MSR	SPCR
President, Director	Thomas Lowry	Thomas Lowry
Vice-President, Director	C. L. Morrison	T. P. Wilson
Secretary, Director	C. G. Goodrich	
Secretary		A. Z. Levering
Treasurer, Director	M. B. Koon	
Treasurer		W. R. Merriam
Director	W. D. Washburn	D. C. Shepard
Director	J. S. Pillsbury	B. J. Stevens
Director	F. H. Peavey	George B. Harris *

* General Manager of the Chicago, Burlington & Quincy Railroad representing the Boston stockholders.

(2) Local stockholdings were lowest on:
January 9, 1888, for SPCR: Lowry 3,334 shares; Morrison and Goodrich 3,333 shares each; Merriam 1,000 shares; Wilson 2,500 shares; Shepard 1,400 shares; Higginson & Co. 13,625 shares, numerous other persons 21,475 shares. Total 50,000 shares.
April 17, 1889, for MSR: Lowry 17,480 shares; Washburn and Pillsbury 1,000 shares each; Goodrich, Morrison, Koon and Peavey 500 shares each; Herrick 20 shares; Higginson & Co. 11,326 shares; numerous other persons 17,174 shares. Total 50,000 shares.
(3) Clinton Morrison resigned as Vice President but not as a Director of MSR. Calvin Goodrich replaced him as Vice-President. E. H. Center was elected Secretary of MSR.
(4) By January, 1891, the local stockholdings in SPCR had increased slightly. Lowry held 7,126 shares, Merriam 500 shares, Morrison 4,249 shares and Goodrich 4,250 shares.

Meanwhile controversy over the use of M.L.&M. Ry. steam motors on downtown Minneapolis streets resulted in the Minneapolis city council passing a revised ordinance permitting use of steam motive power north of Washington Ave. S. for three additional years, until November 1, 1889. The M.L.&M. Ry. objected as its management was reluctant to install expensive cable construction because if sewers were subsequently installed and the street settled, the track and underground machinery would be adversely affected. The first of two SPCR cable lines had been completed in late 1887. The Sprague Electric Railway and Motor Company put into operation during February to May, 1888, a complete electric railway system in Richmond, Virginia. Apparently Thomas Lowry had visted the Richmond system during the summer of 1888. In a letter dated September 21, 1888, addressed to the Minneapolis mayor and city council he requested approval for construction of an experimental electric line. The Sprague Electric Railway and Motor Company had proposed equipping any existing horsecar line for electric operation at its expense, and to operate and maintain it in successful operation from January 1, 1889, to June 30, 1889, also at it expense, to be repaid only if the operation performed efficiently, successfully and satisfactorily. Lowry selected the Hennepin & Lyndale Avenue line: on Hennepin Ave. from Bridge Square to Lyndale Avenue, thence on Lyndale to 27th St., 27th St. to Dupont Ave., and Dupont Ave. to the south city limits. MSR was required to furnish the right-of-way within 30 days from September 14th or the contract would be void. The Minneapolis city council only referred the question to its committee on railways.

As a public relations move, on April 10, 1889, Lowry announced the MSR decision to build two cable lines. One would replace the M.L.&M. Ry. steam motor line from Bridge Square out 1st Ave. S. and Nicollet Ave. to 31st St., and the second would replace the heavily traveled Washington Ave. horsecar line between 20th Ave. N. and Cedar Ave. A month later, on June 7, 1889, MSR submitted a formal proposal to the Minneapolis city council.

However on that same date, the city council received an application for a franchise for a new and extensive cable line system to compete with MSR. Attached was a proposed ordinance specifying the streets on which the cable cars would run and defined a system which would serve the greater part of the city. Most of the new trackage would run on streets parallel to those used by the horsecars. The application was signed by two obscure real estate men, Robert J. Anderson ~~adn~~ and Walter P. Douglas, whose firm was Anderson, Douglas & Company. Supposedly their associates were wealthy gentlemen involved in the cable systems of Philadelphia, Chicago and Pittsburgh. From July 7th until July 19th the issues were hotly debated as there was considerable resentment for MSR by much of the citizenry who wanted cable lines and free transfers between connecting lines which they had come to expect but which MSR had not seen fit to offer. On July 18th the Committee on Railways adopted by a vote of six to two a report in favor of MSR, which pointed out the absurdities which would result from two competing systems and recommended the existing company be given the first opportunity to provide the cable lines and free transfers. The report specified the streets for three cable lines to be built by MSR, together with completion dates. Included was a provision for an experimental electric line to be chosen at a later date. On July 19th the city council met and approved the committee's report by a vote of 20 to 19.

In order to meet the council's completion dates, construction of the cable lines had to be begun immediately. MSR quickly placed orders for specially designed steam engines as well as a large quantities of rail, track materials, cable yokes, manhole frames and covers, and cable driving machinery and sheaves. As of 9-1-1889 MSR and ML&M Ry. (as lessee and lessor) joined in an issue of $5,000,000 30-year 5% first consolidated mortgage bonds on all their properties. Reports vary as to the amount MSR spent on the cable line materials and machinery. Frank Trumbull in a January, 1893, report reported $300,000 to $400,000. F. W. Cappelen in his 1-1-1916 valuation report stated that approximately $200,000 to $300,000 was claimed to have been invested.

Then on September 14, 1889, the Minneapolis city council authorized an experimental electric line similar to that which MSR had requested a year earlier. The Thomson-Houston Electric Co. had submitted a proposal to MSR to build and equip one complete electric railway line at its expense. After it had been demonstrated an assured success MSR would purchase it at a fixed price. The route finally approved was to run from 1st Ave. S. and 3rd St. out 4th Ave. S. to 34th St. While the cable equipment lay stored unused, the electric line was rushed to completion. The first electric cars were placed in service at 4:00 p.m. December 24, 1889, only 100 days after authorization by the city council. The electric line won immediate and unanimous approval. On January 17, 1890, after three weeks of electric service, the city council directed MSR to substitute electric lines for the three cable lines previously ordered and on any other horsecar lines it might choose. On September 19, 1890, the city council passed an ordinance ordering all horsecar lines to be electrically operated.

Meanwhile, in St.Paul, John Ireland, archbishop of the Roman Catholic archdiocese of Minneapolis and St.Paul, proposed the construction of electric lines to connect downtown St.Paul with a new real estate development around a tract of land owned by the archdiocese and St.Thomas Seminary. In June, 1889, Archbishop Ireland and real estate developer Thomas Cochrane entered into an agreement with SPCR for the construction and operation of two electric lines. SPCR agreed to have the first line running within six months providing a bonus of $250,000 (to protect SPCR from financial loss) was raised and paid to SPCR in installments extending over a nine month period beginning with the laying of rails. The first line was to run from 7th St. and Wabasha St. on W. 7th St., Oakland Ave. and on Grand Ave. to Cleveland Ave. The second line was to run from 4th St. and Wabasha St., on W. 4th St., W. 7th St. and on Randolph Ave. to Cleveland Ave.

As SPCR's charter did not allow anything but horsecar operation, SPCR asked the St.Paul city council for authority to proceed with construction of the first two electric lines and also for the right to electrify its horsecar lines. By the time the necessary ordinance had been prepared several other individuals and corporations had applied for franchises to build competing and conflicting lines on the streets of St.Paul. After much agitation and discussion SPCR asked the St.Paul Chamber of Commerce to appoint a committee to confer with the council's committee in an effort to arrive at a joint recommendation. After many meetings, both public and private, the joint committee recommended that SPCR be granted the right to operate all of its lines by cable, electric, pneumatic or gas power, at the option of SPCR. The St.Paul city council unanimously accepted the recommendation by resolution on September 19, 1889, only five days after the approval of the first electric line by the Minneapolis city council. Construction then began on the Grand Ave. line by the Northwest Thomson-Houston Co. The new electric line began operation February 22, 1890. Here too the results were so successful that SPCR was authorized to electrify its entire system and agreed to build and electrify 32.4 miles of new double track additions during 1890-1891.

Officers of the two companies during this 1889-1890 time period were as follows.

	MSR	SPCR
President	Thomas Lowry	Thomas Lowry
Vice-President and General Manager	Calvin Goodrich	
Vice-President		Calvin Goodrich
Secretary	E. H. Center	A. Z. Levering
General Manager and Superintendent		A. L. Scott (Albert L.)
Treasurer	not listed	not listed

ORGANIZATION OF THE TWIN CITY RAPID TRANSIT CO.

The horsecar lines had scarcely been completed when the work of electrifying the entire system began. Both companies had never paid their stockholders any dividends, the meager profits having been re-invested in expansion, improvements and better service. The conversion to electricity required complete reconstruction and resulted in the loss of most of the original investment. During electrification the opportunity was taken to greatly expand the track mileage into new areas where no previous settlement existed. The estimated cost of electrification was $2.5 million; an additional source of financing had to be found.

Various means of financial assistance were offered by the manufacturers of the electrical equipment used in the new systems. The largest of these companies was the Edison General Electric Company, which in 1889 secured control of the Sprague Electric Railway & Motor Company which had built the successful pioneer electric railway in Richmond, Virginia. Henry Villard and some German capitalists had put together and controlled the Edison General Electric Co. This was the same Henry Villard who some years earlier had taken over control of the Northern Pacific Railroad Co. and completed the first complete railroad between the Twin Cities, Duluth, and the Pacific

Coast in September 1883. In October 1889 he had been elected Chairman of the Board of Directors of the Northern Pacific RR. Thomas Lowry and Henry Villard must have been well-acquainted.

Shortly after electrification had been approved by the city councils, Lowry went to New York to confer with Villard. Charles Fairchild of Lee Higginson & Company joined the discussion and the negotiations continued for several weeks. In March 1890 Henry Villard signed a contract agreeing to provide all the financing for the MSR and SPCR electrification. On March 28, 1890, the boards of MSR and SPCR authorized the execution of construction and equipment contracts, including the purchase of electric motors from the Sprague Electric Railway & Motor Co.

The Board of Directors of each company authorized the listing of their capital stocks and bonds on the New York Stock Exchange during August, 1890.

During the summer of 1890 the U.S. Congress passed the Sherman Silver Purchase Act which shook the world's confidence in the U.S. dollar. On November 20, 1890, the dominant London banking house of Baring Brothers failed, and days later the New York firm of Decker, Howell & Company, which was known as Villard's brokerage firm, was declared bankrupt. Villard's expansionist influence, combined with poor judgement, had increased the Northern Pacific RR debt through the sale of more bonds, and conflicts of interest among those responsible for managing the N.P.'s affairs, helped lead the N.P. RR. into financial disaster. Villard, though his credit was badly shaken, expressed confidence in his ability to fulfill his obligation to MSR and SPCR. But by the end of 1890 it became clear that Lowry would have to look elsewhere for financing.

The total cost of electrification of both MSR and SPCR totaled $6.0 million instead of the original estimate of $2.5 million. The original plan had called for selling bonds of MSR and SPCR in the total amount of $5.8 million. In January 1891 there remained unsold about $1 million in bonds of MSR and $1.5 million of SPCR. Fairchild, representing the Boston investors, again joined Lowry in New York. It took them almost six months to secure financing. The MSR bonds were relatively easily to sell, but the SPCR bonds presented problems. The St.Paul cable lines, built in 1887 and 1888, were estimated to cost $600,000 but actually had amounted to about $1.0 million. In addition, St.Paul was, for various reasons, not nearly so good a streetcar city as was Minneapolis, and the SPCR earnings had lagged from the start.

The two best prospects were J. Kennedy Tod of J. Kennedy Tod & Company and Jacob Schiff of Kuhn, Loeb & Company. Tod and Schiff were willing to buy the SPCR bonds if Lowry could find one other qualified banker to take part of them. The unsold bonds amounted to $1.75 million. Two firms almost agreed but did not. It was J. Kennedy Tod who devised a method of making the SPCR bonds more saleable by placing the credit of MSR behind them. Tod proposed the formation of a new holding company which would acquire all the stock of both MSR and SPCR and which would then guarantee the SPCR bonds.

On June 3, 1891, the Twin City Rapid Transit Company was incorporated at Elizabeth, New Jersey, for this purpose. The incorporators were H. W. Cannon, George Bliss, G. S. Coe, all of New York, and others. J. Kennedy Tod & Company and Kuhn, Loeb & Company finally bought the SPCR bonds, but even with the holding company's guaranty, they exacted a further concession. About 20% of the common stock of both MSR and SPCR was delivered to the bankers, together with an attractive purchase option. The financial disaster had been averted, but at a price to the stockholders.

It took several years for TCRT to complete the exchange of TCRT stock for MSR and SPCR stock. Apparently the exchange rate was 2.25 TCRT shares for 1.00 MSR share and 0.75 TCRT share for 1.00 SPCR share. As we do not have the TCRT corporate minute books we do not know how Lowry and his associates fared with regard to the exchange of stock. After all of the financial problems of the 1890's were over, Goodrich Lowry states that at Thomas Lowry's death in 1909 he owned 3,000 shares of TCRT's outstanding 180,000 shares of common stock.

Effective January 1, 1892, the two companies began operation as a consolidated system under TCRT control. By the fall of 1892 electrification had been completed. At the request of Kuhn,Loeb & Company, New York City, Mr. Frank Trumbull of Denver inspected the Minneapolis and St.Paul systems and issued a detailed printed report dated January 18, 1893. A copy of this report was located and much of the technical information used in other sections of this book. His summary stated that he considered this property the finest he had yet examined; in his opinion it was the best at present, of its kind, in the west.

The company felt that the time had arrived when it might reap the benefit of increased earnings and be able to pay off some of the heavy indebtedness which had been incurred. But the financial panic of 1893 occurred with the result that the company's earnings did not increase as had been expected, but in common with general business at the time, suffered greatly. It was almost impossible to obtain sufficient money from the earnings and the company's limited borrowing capacity to keep things going and maintain the extensive service which had been established with the electrification of the system.

Frank Trumbull, on a second visit in 1894, advocated conversion of the Selby Avenue cable line to electricity with the exception of the portion on Selby Hill. However coincidently with the slump in business due to the financial panic, the company had to contend with severe bicycle competition during 1893 to 1896 which further cut into the earnings.

During 1896 the City of Minneapolis paved the streets in the business district. 43.6 miles of track built during 1891 had to be replaced with more substantial construction because of the type of pavement selected. The interruption of service caused by the construction work resulted in loss of business which together with the costs of track rebuilding created additional financial burdens for the company. It was nearly impossible to borrow additional money for the construction work; only by enforcing rigid economies and close figuring of expenses was the company enabled to succeed in paying the costs.

THE FORMATIVE YEARS

The period from 1898 to World War I saw the greatest growth and expansion of the system as well as the "golden era" of streetcar transportation. The first major expansion steps occurred in 1898 and 1899:

1. the second inter-city line, "Como-Interurban-Harriet", was completed;
2. the Selby Avenue cable line was electrified using a counterweight system installed on Selby Hill;
3. the program of designing and constructing streetcars in company facilities was begun; and
4. acquisition of the St.Paul & Suburban Railway (successor to the St. Paul & White Bear Railroad) between St.Paul and Mahtomedi on White Bear Lake.

As this acquisition resulted in operation outside the Minneapolis and St.Paul city limits, for various legal as well as financial reasons, the Minneapolis & St.Paul Suburban Railway Co. was incorporated June 9, 1899, as a wholly owned subsidiary of TCRT. Incorporators were Thomas Lowry, Calvin Goodrich, Martin B. Koon, Marcus D. Munn, and J. F. Calderwood. The new corporation acquired the St. Paul & Suburban Ry. September 6, 1899. This acquisition included Wildwood Park on White Bear Lake. Further developments during 1899 resulted in extension of this line to Stillwater and construction of the street railway system within Stillwater.

TCRT also began paying dividends on common stock during 1899. Officials of TCRT (and subsidiaries) responsible for this growth were: Thomas Lowry, President; Calvin Goodrich, Vice President, Secretary, Treasurer; Willard J. Hield, General Manager; J. F. Calderwood, Comptroller; R. C. Taylor, Master Mechanic; R. L. Costigan, Storekeeper-Purchasing Agent; Edward Scofield, Chief Electrical Engineer; and George L. Wilson, Engineer and Roadmaster.

The next period of expansion occurred during 1902 through 1907 when the following were accomplished.

1. Construction of the new Main Steam Station and A.C. power distribution system.
2. New office buildings constructed in Minneapolis and St.Paul.
3. New extensive shop buildings and facilities constructed at Snelling and University Avenues in St. Paul.
4. The third inter-city line was completed, the "Selby-Lake" line, which included construction of the Selby Tunnel replacing the counterweight system on Selby Hill.
5. Acquisition of the independent suburban St.Louis Park and Robbinsdale lines by the Minneapolis & St.Paul Suburban Railway.
6. Extensive new track construction in both Minneapolis and St.Paul.
7. Improvement of Wildwood Park.
8. Construction of the Stillwater Division branch line to White Bear and extension of the Stillwater street railway system to South Stillwater.
9. Construction of the interurban line to Lake Minnetonka, the building of Big Island Park and purchase of the Lake Park Hotel at Lake Minnetonka, and building of the express and ferry boat fleets for operation on the Lake.

The Transit Supply Company was incorporated June 12, 1907, as a wholly owned subsidiary of TCRT to act as a fiscal, purchasing and stores agent for all the other corporations. As such it performed all accounting and financial services, engineering, purchasing and storekeeping, and operated the Snelling Shops.

Company officers during this time period were the following.

Street Railway Journal 3-1-1902 Article

President	Thomas Lowry
Vice-President	Calvin G. Goodrich
Secretary, Treasurer	Calvin G. Goodrich
Auditor	J. F. Calderwood *
General Manager	Willard J. Hield
Purchasing Agent	R. L. Costigan
Mpls. Div. Superintendent	G. Brigger
St.Paul Div. Superintendent	D. S. Smith
Master Mechanic	R. C. Taylor
Electric Engineer	E. H. Scofield

1908 Minneapolis History

President	Thomas Lowry
Vice President and Managing Director	Calvin G. Goodrich
Secretary	E. S. Pattee
Comptroller	E. S. Pattee
Treasurer	E. A. Crosby
Auditor	D. J. Strouse
General Manager	Willard J. Hield
Gen. Psgr. Agt.	A. W. Warnock
Mpls. Div. Supt.	Horace Lowry
St.Paul Div. Supt.	J. S. Pevear
Int. Lines Supt.	L. S. Cairns

* Past President of the American Street Railway Accountants Association

Although Thomas Lowry lived to see his confidence justified and his enterprise successfully established, the satisfaction this fulfillment gave him was not to be long enjoyed. He had to battle a disease (tuberculosis) which persistently followed him the greater part of his life. After an extraordinary and prolonged defense he surrendered to the inevitable, dying on February 4, 1909. Calvin Goodrich was then elected President and Willard J. Hield Vice-President and General Manager. Mr. Goodrich continued his predecessor's policies. He had closely studied the transportation needs of the two cities and suburbs, looking for future opportunities and possibilities and seeking the careful organization and steady expansion needed to make the system of real public worth and value. He had long been recognized as one of the most forceful business executives in Minneapolis. Elected President of the Duluth-Superior Traction Company in 1900 he was largely responsible for the development and management of that system as well. His only child, son Donald, eventually became General Superintendent of TCRT.

The fourth inter-city line, the "Snelling-Minnehaha" line through Fort Snelling, was completed during 1909.

The Rapid Transit Real Estate Corporation was incorporated June 2, 1910, as a wholly owned subsidiary of TCRT. Its purpose was to acquire and hold title to various parcels of real estate owned by the various subsidiary companies but not used in the operation of the street railway system. This included land held for right-of-way or terminal purposes not at present directly useful for the operation of the railway property, although in some instances it had a direct connection therewith. It also owned the gravel pits in St.Paul and South St.Paul which supplied gravel for construction and maintenance work on the entire system.

The Minneapolis & St.Paul Suburban **Railroad** and the Minnetonka & White Bear Navigation Company were incorporated in March, 1910, as wholly owned subsidiaries of TCRT. Property, franchises and equipment of the Minneapolis, Lyndale & Minnetonka Railway and the Minneapolis & St.Paul Suburban **Railway** were deeded to the new corporations effective January 1, 1911. Railway operations, including the terminal docks at Excelsior and Wildhurst, were assigned to the M&StPS **Railroad**. The steamboat lines, park, hotel, restaurant and amusement enterprises on Lake Minnetonka and White Bear Lake were assigned to the M&WBN Co.

Thomas Lowry had married Beatrice Goodrich, daughter of Dr. C. G. Goodrich (the father of Calvin G. Goodrich). Son Horace was born February 4, 1880, and after graduation from the University of Minnesota in 1900 worked the next two years as an electrician in the shops of the Minneapolis St. Ry. The following year was spent in the auditing department of MSR where he became chief clerk. He then left MSR to manage his father's real estate and other business interests, but in 1908 returned to MSR as Superintendent of the Minneapolis Division. Again he left MSR, resigning in December,1910, to become president of the Arcade Investment Company which proceeded to erect the 12-story Lowry Building in downtown St.Paul. On January 1, 1912, he was elected General Manager of TCRT and exactly one year later 1st Vice-President. At this time the corporate officers were: Calvin Goodrich, President; Horace Lowry, 1st Vice-President; John R. Mitchell, 2nd Vice-President; A. M. Robertson, 3rd Vice-President, Secretary (and President of Duluth-Superior Traction Co.); E. A. Crosby, Treasurer; and D. J. Strouse, Auditor.

Calvin Goodrich attended a meeting of the TCRT Board of Directors in New York December 6, 1915, and contracted a severe cold, resulting in complications which terminated his life on December 21, 1915. Horace Lowry was elected President January 1, 1916, and Edward W. Decker 1st Vice-President. Under Horace Lowry's administration the high standards of service were continued, interests of the company conducted on constructive and progressive bases, further development of the system carried out, and greater efficiency attained.

Although in terms of miles of track and number of cars operated the system had not yet reached its zenith, this period marked the beginning of the end of the "romantic" era of the streetcar. World War I was in progress and things would never be quite the same after the war ended. The first item of importance undertaken was an adjustment of the franchise relations with the City of Minneapolis. This involved a complete valuation of Minneapolis St. Ry. as of January 1, 1916. F. R. Cappelen, the Minneapolis city engineer, conducted the study, with A. L. Drum & Company, consulting engineers of Chicago, representing MSR.

THE DIFFICULT YEARS

According to TCRT's 1918 Annual Report the company was forced to economize operations; cost of materials had increased 40% to 200% and wages 60%, but gross earnings had declined due to the lack of commercial prosperity (very few war contracts were obtained by local industries) and a flue epidemic. A contract was made for opening a coal mine in Illinois so that the power plant coal could be obtained at the cost of production. The company also purchased several motor buses which had been operated by competitors and began running some of them in north Minneapolis on a newly opened and paved street on which no streetcars were operated. This was TCRT's first bus operation.

Corporate officers during this time period were the following. Horace Lowry, President; E. W. Decker, 1st Vice-President; J. R. Mitchell, 2nd Vice-President; A. M. Robertson, 3rd Vice-President, Secretary; Foster Hannaford, General Manager; W. D. Dwyer, General Counsel; E. A. Crosby, Treasurer; D. J. Strouse, Auditor; J. J. Caufield, General Superintendent; A. W. Warnock, General Passenger Agent; William Whiteford, Purchasing Agent; E. H. Scofield, Engineer of Power and Equipment; Walter J. Smith, Master Mechanic; George L. Wilson, Engineer Maintenance of Way; Harry W. Ralph, Schedule Superintendent; and P. J. Metzdorf, Park Superintendent.

MSR negotiated a service-at-cost franchise with the City of Minneapolis but this was defeated by the voters. The City of St.Paul was considering amending their franchise with SPCR which resulted in a complete valuation of SPCR as of January 1, 1920. All these moves took place during 1919 when TCRT was trying to obtain additional revenue to ~~of~~ offset increased costs. The First Mortgage Bonds of the Minneapolis, Lyndale & Minnetonka Ry. totaling $5 million matured January 15, 1919, but payment had to be extended over an additional three years.

During 1920 substantial service increases were requested by Minneapolis and St.Paul; the company succeeded in obtaining emergency fare increases. TCRT was in hopes that the Minnesota legislature would enact a law containing provisions to establish the fair value of the property upon which the company would earn a reasonable rate of return. Until this time each system was under the control of the respective city councils thus creating many problems and differences. The Minneapolis franchise was to expire July 1, 1923. On April 29, 1921, the state legislature passed the Brooks-Coleman Law providing that the companies would operate under indeterminate permits granted by the state. Permits were to continue in full force and effectg unless and until the cities would acquire the property within their corporate limits, or unless terminated or modified by the state legislature. The Minnesota Railroad & Warehouse Commission was given exclusive power and authority to establish rates of fare and exercise control over suburban portions outside the city limits; the individual city councils retained control over operations and routing of car lines; no changes in routes or schedules were to be made without council permission. A fare increase was immediately obtained by the companies. On June 23, 1921, the companies petitioned the MRR&WC for valuation of their properties. This work was begun in November, 1921, by A. L. Drum & Company representing MSR and SPCR and Dr. Delos F. Wilcox representing the City of Minneapolis. In 1921 T. Julian McGill was elected 1st Vice President replacing E. W. Decker.

Business conditions began improving during 1922. However TCRT decided to plan no future improvements other than to the dollar amount of annual depreciation until the valuation and rate of ~~to~~ return study was completed. TCRT management felt they should know where they stood financially before planning any long-range improvements. The high standards of maintenance were to be continued.

Both cities and TCRT filed their respective valuations on June 5, 1923. Hearings on the valuation began October 8, 1923, and continued until December 13, 1924. On March 6, 1925, the MRR&WC made public its findings on the valuation and on July 3rd issued its order as to rate of return and the rate of fare. Of course all parties were dissatisfied; the cities thought the valuation was too high while TCRT thought the rate of fare insufficient to earn a reasonable return. After considerable negotiations a compromise agreement was reached on October 23, 1925, in which it was agreed to (1) accept the fair value of the property at the valuation fixed by the Commission (MSR $26,787,228 and SPCR $16,196,090) and (2) accept a 7½% rate of return upon such valuation as fair and reasonable. On December 22, 1925, the MRR&WC set the rate of fare at eight cents cash, or six tokens for forty cents, effective January 1,1926. TCRT thought that with careful and economic operation it could earn the 7½% return.

On August 1, 1924, TCRT had acquired all the shares (except qualifying directors'shares) of the Twin City Motor Bus Company. TCMB operated buses on University Ave. between Minneapolis and St.Paul. TCRT purchased two other motor bus competitors in late 1925: American Auto Transit Company, November 24th, and Minneapolis & St.Paul Bus Line, December. During May, 1926, it was decided to merge the independent companies into TCMB, accomplished June 1, 1926. TCRT management believed that all public transportation in the Twin Cities should be controlled by one company. In fact TCRT felt that the constantly increasing use of the motor vehicle made it imperative that it should engage itself in all forms of public transportation. A Minneapolis investment house secured control of practically all the taxi-cab companies operating in Minneapolis and St.Paul as well as some outside points in the state. On January 4, 1927, TCRT acquired this controlling interest from the investment house. This was the Yellow Cab Corporation of Minnesota which owned 300 taxi-cabs in 1928. Thus TCRT had gained practical control of all public transportation in the entire community it served. However this taxi-cab investment was disposed of during 1929.

Horace Lowry died August 22, 1931. Under his administration the system reached its highest point, operating 1,021 cars over 524 miles of track. T. Julian McGill was elected President in 1931 to replace him.

The effects of the economic depression were creating problems for TCRT with which the McGill administration were forced to cope. Conversion to one-man operation of streetcars was begun in 1931 and continued through 1937. The first trackage abandonments took place during 1932 when the impressive but unprofitable operations to Lake Minnetonka, White Bear and Stillwater were discontinued. As always seems to be the situation, the most colorfual and interesting operations were the first to go.

A. M. Robertson died July 2, 1933, just shortly before re-organization of the Duluth Street Railway removed it from TCRT-affiliated ownership and management. The year 1933 was the low point of the depression; the net profit after fixed charges amounted to only $50,536.

Other company officers during the McGill administration were: E. W. Decker, Vice-President; D. J. Strouse, Vice-President, Secretary; E. A. Crosby, Treasurer; Sibbald MacDonald, Comptroller; Donald Goodrich, General Superintendent; Walter L. Larson, Purchasing Agent; L. B. Farrington, General Passenger Agent; and Walter J. Smith, Master Mechanic.

T. Julian McGill died October 10, 1936, continuing a tradition set by each of his predecessors, that of dying while holding office.

He was succeeded by D. J. Strouse as Executive Vice President until elected President. Mr. Strouse had worked his way upward through the organization from the position of Auditor under the administration of Thomas Lowry. TCRT was fortunate in that its destinies were in the hands of builders; men who felt their responsibility for supplying transportation as good as their means would permit. The system was never allowed to deteriorate, being agressively maintained in line with modern standards. Mr. Strouse had the most difficult problems of all to contend with.

No new track extensions had been built since 1933. No rail lines, other than the suburban lines abandoned in 1932, had been supplanted as of 1937. In that year it was announced that bus replacements would be confined to those instances where major track reconstruction was required. Highway changes requested by the Minnesota Highway Department resulted in abandonment of the first car lines in Minneapolis during 1938. The first St.Paul abandonments also took place during 1938. However TCRT found that substitution of buses did not increase patronage; that bus revenues declined to the same extent and for the same reasons rail revenues declined. The abandonment policy was modified to consider bus substitution desireable in certain circumstances where traffic was not too heavy.

TCRT was re-incorporated June 20, 1939, in Minnesota to avoid certain New Jersey franchise taxes and because of Minnesota corporation law changes. The New Jersey corporation and the Minnesota corporation were merged during 1939, with the Minnesota corporation the survivor.

Officers of the company through most of the Strouse administration were the following. Burton G. Noah, Vice-President; Jefferson L. Alexander, Vice-President in Charge of Operations; A. D. Starkey, Treasurer; Donald Goodrich, Assistant Treasurer; Sibbald MacDonald, Secretary, Comptroller; Daniel J. Bren, Assistant Secretary; F. R. Bjork, General Superintendent; Luther G. Bakken, Superintendent-Minneapolis Division; E. D. Templeton, Superintendent-St.Paul Division; Walter L. Larson, Purchasing Agent; Robert F. Fitzsimmons, General Passenger Agent; Frank S. Morgan, Engineer of Power; Oscar F. Moore, Engineer-Maintenance of Way; and Lynn G. Barnes, Superintendent of Equipment.

A modernization program was approved during 1944 to purchase annually a number of streamlined streetcars to replace the existing equipment: 40 PCC cars were ordered for delivery in October and November, 1945. Mr. Strouse expressed management's views at that time as follows. "Believing that streetcars are and always will be the best vehicle of mass transportation in the areas of dense population, we have been working, planning and digging to cut expenses, and at the same time furnish the best service that our resources will permit. We are convinced that the streetcar is as necessary to most people as it ever was. The thousands who have to ride streetcars, and the other thousands who prefer to, are entitled to good cars and good service, and they are going to get them." By the summer of 1949, 100 additional PCC cars had been placed in service.

THE DECLINING YEARS

TCRT's policy was to use profits to pay off its bonded indebtedness and/or to reinvest them in modernization of the system. Charles Green, a Wall Street stock speculator, purchased 6,000 shares of TCRT stock in 1948 in anticipation of substantial dividends. When none were forthcoming, Green wrote a letter to all 3,000 TCRT stockholders demanding that they join him in ousting President Strouse and the Board of Directors. Strouse invited Green to Minneapolis for a talk, but the meeting was a stormy one and Green returned to New York determined to wage a proxy fight to gain control of the company. Green hired a prominent Minneapolis lawyer, Fred A. Ossanna, to aid him in the battle. More letters went out from Green to the stockholders, and on November 8, 1949, he was successful in gaining control.

Green immediately discontinued the rehabilitation program for equipment, laid off more than 800 employees, cut track maintenance to a minimum, and relentlessly cut schedules. He did this so belligerently and with such a lack of diplomacy that he amazed even his associates, who by now included some notorious Twin City underworld characters. Much antagonism developed between Green and the city councils of both cities regarding methods used to reduce service. The newspapers denounced him frequently. Green threatened to liquidate the entire St. Paul system because of insufficient profit, and even threatened to force a profit out of TCRT by auctioning off the cars and buses and selling the rails for scrap. This caused several investigations to be launched into the company's affairs, including one by the Minnesota Railroad & Warehouse Commission which obtained a court order restraining the company from abandoning any more lines without hearings. Green had originally stated that all rail lines would be replaced with buses by 1958 but later modified his stand by indicating that many heavy-traffic streetcar lines would be retained.

Things quieted down for awhile, but soon certain members of the Board of Directors decided to scuttle Green whose heavy-handed tactics had so alienated the public. However his shares were needed to keep the group in power and he was re-elected President at the March, 1950, annual stockholders' meeting.

On May 12, 1950, his opposition acted. It was announced that Green had been stripped of his authority to act as company spokesman and thereafter all official statements would come from Fred Ossanna. Green and Ossanna clashed repeatedly and bitterly over company policies. Green finally sold his TCRT stock March 12, 1951, at a profit of $100,000. Emil B. Asleson served as President for a short period of time until Ossanna became President in 1951.

The Minnesota Railroad & Warehouse Commission 1951 study of TCRT reported that gangsters owned about 16% of TCRT stock. COLLIER'S WEEKLY, September 29, 1951, published an article by Gordon Schendel entitled "How Mobsters Grabbed a City's Transit System".

Under Ossanna's administration additional economy measures were introduced and service was further reduced because of loss of patronage. An accelerated bus conversion plan was announced, to be completed by 1954. Benson M. "Barney" Larrick, an experienced bus conversion expert, was hired from Los Angeles to preside over the conversion which began in earnest during 1952. The conversion was able to be completed during 1954 due to General Motors Corporation providing the financing for the purchase of 525 buses.

As it turned out, the conversion was a pillage of the electric railway system for the purpose of illegal personal profit for Ossanna and his associates. Investigation of the business transactions made during the conversion from streetcar to bus operation resulted in criminal fraud indictments. Fred Ossanna, President, and Benson M. Larrick, Vice-President and General Manager, resigned December 17, 1957. The new TCRT management filed a civil suit against the defendants for recovery of the total amount the federal government claimed was lost to TCRT stockholders.

The individuals indicted were: Fred Ossanna; Benson Larrick; James Towey, former TCRT Secretary-Treasurer; Harry and Fred Isaacs, father and son respectively, operators of American Iron & Supply Co.; Theodore Landy, an associate in the scrap metal business; Earl Jeffords, Minneapolis real estate agent; and Isadore (Kid Cann) Blumenfeld, a Minneapolis crime character and liquor figure who allegedly took advantage of his position as a TCRT stockholder to profit individually from the conversion.

The general thrust of the lawsuits was that TCRT assets were sold at below market prices in return for payoffs. Among the losses the government claimed that TCRT suffered were the following.

1. Sale of underground cable valued at $938,107 to American Iron & Supply Co. for $122,158. The indictment also stated that American Iron & Supply Co. got all TCRT conversion scrap metal for "grossly inadequate or, in some cases, no consideration".
2. Sale of 11 parcels of real estate for $300,000 to Mid-Continent Construction & Development Co. which held them for the capital gains tax period, then quickly resold them for $475,000. Partners in Mid-Continent were Harry Isaacs and Robert Levitt, a Minneapolis attorney, who had five sub-partners, one being Isadore Blumenfeld.
3. Payment of $107,500 in "unearned commissions" to Jeffords. This included $75,000 for the sale of the Snelling Station property in St.Paul for which Paul Villaume, a St.Paul real estate agent, previously had been paid a $37,500 commission. The day after Villaume received his commission, he contributed $7,500 to the Ossanna Foundation.
4. Sale of 91 late model streetcars to the Mexico City transit system with "grossly excessive discounting of notes and by lent commissions". This loss was in excess of $250,000.

The fraud trials were completed August 6, 1960. All of the defendants except Blumenfeld were convicted of some of the charges. Blumenfeld was found not guilty of all the charges he faced. The major sentences and fines were as follows.

1. Fred Ossanna, convicted on 13 counts, including mail fraud and interstate transportation of property taken by fraud: four years in prison, $11,000 in fines, and estimated $5,000 in court costs.
2. Benson Larrick: two years in prison and $3,000 in fines.
3. Harry Isaacs: four years in prison, $11,000 in fines, and estimated $5,000 court costs.
4. Fred Isaacs: one year plus one day in prison, $2,500 in fines.

5. Earl Jeffords (head of J. & C. Holding Co., real estate dealer): 18 months in prison, $1,500 fine.

The Green-Ossanna management took only five years to reduce to scrap metal what had taken the Lowry managements over fifty years to build: one of the finest street railway systems in America.

MINNEAPOLIS HORSE RAILROAD COMPANY
History compiled from Minneapolis Tribune articles

January 7, 1868: Organization will be completed in a few days. Soliciting capital stock subscriptions Work of track laying will be commenced early in the coming spring. The road from the falls to the levee for carrying freight to and from the boats will be first constructed, and will probably be in running order to accommodate the spring trade. The ordinance granting the company right-of-way through certain streets provides that not less than two miles shall be constructed during the present year.

March 13, 1868: Work will probably commence about May 1st in laying the track from the mills to the levee.

No news until June 30, 1869: Ground broken for the horse railroad and surveys made.

November 15, 1869: Grading and tie laying on the street railroad.

November 26, 1869: An injunction asked for at the district court against the laying of the city railroad.
December 6, 1869: Injunction granted [unreadable] track laying on 2nd St.
December 10, 1869: Removed [unreadable] to the new track building on Wash[unreadable].

December 18, 1869: Arrival of a horsecar for the city railroad.

December 22, 1869: The formal opening of the horse railroad took place yesterday; introduction of the first streetcar brought to the state. For some time the company has been busy laying the track on Second St., from before California St. near the Chicago Milwaukee & St.Paul Railroad depot up to Nebraska St., near the St.Paul & Pacific RR depot. This route having been completed and the first streetcar (manufactured by Coan & TenBroeke, Chicago) having arrived, some of the officers of the company, with a number of prominent citizens, yesterday afternoon took a ride over the road and formally opened it. The car made several trips over the route and was crowded each way.

December 22, 1869: The company commenced yesterday surveying the Washington Ave. route; they propose going right ahead and lay the track, and have it ready for the cars by the first of January. The iron rails for this portion of the route was expected last evening.

December 30, 1869: Completion of the city railroad on Washington Ave.
December 31, 1869: Formal opening of the Minneapolis City Railroad. [sic]
January 1, 1870: The Washington Ave. route of the horse railroad was formally opened yesterday and the horse car traversed it from one end to the other. The road will be extended and several new cars added next season.

February 5, 1870: F. A. Gilson, president: This company has purchased depot buildings and grounds and laid track during the past year on Second St. between the Milwaukee Road depot and the Pacific Railroad depots, and so connect these two great lines fo thoroughfare. Cars are transferred daily from road to road and the freights already amount to a handsome sum. The streetcar also traverses the track which has been laid on Washington Ave. between the two depots, and pays its operating expenses. In the spring the track will be extended on Hennepin Ave. to 10th St. or 12th St., thus affording that portion of the city convenient means of locomotion. The investment thus far by the company is $35,000.

June 16, 1870: News of the death of Frederick A. Gilson in New York yesterday morning reached this city by telegraph early in the forenoon. At the time of his death he was president of the Minneapolis Horse Railroad Company, a director in the new cotton mill, the Tribune printing company and the gas company.

September 7, 1870: Yesterday morning the laying of the new iron rails was commenced at the intersection of Second St. and Hennepin Ave. Leading out of Hennepin Ave. two tracks will run into the Second St. track, one toward the Pacific depot end and the other toward the Milwaukee depot. Track will be immediately laid up Hennepin Ave. to Tenth St. The company is negotiating for the iron rails for an extension of the track from Hennepin Ave. down Tenth to Cataract, down Cataract to Washington Avenue. If the extension is made other cars will be put on. The railway to Tenth St. will be finished for use this fall. The track now being laid is different from that formerly in use, and is much surer and better.

No news until July 22, 1871: Alderman Moore also moved that the committee on railways in connection with the city attorney, be requested to examine and report if the city council has the power to revoke the rights fo the Minneapolis Horse Railroad Company which were granted them by ordinance passed December 28, 1867. Adopted July 15, 1871.

July 29, 1871: The Milwaukee Road has purchased the track on the street railroad up Second St. and will commence taking it up in a short time. The building of the Duluth railroad down the river bank accomplishes all the connection the Milwaukee Road ever asked for, so the street railway has ceased to be of any use. This thing was also a nuisance.

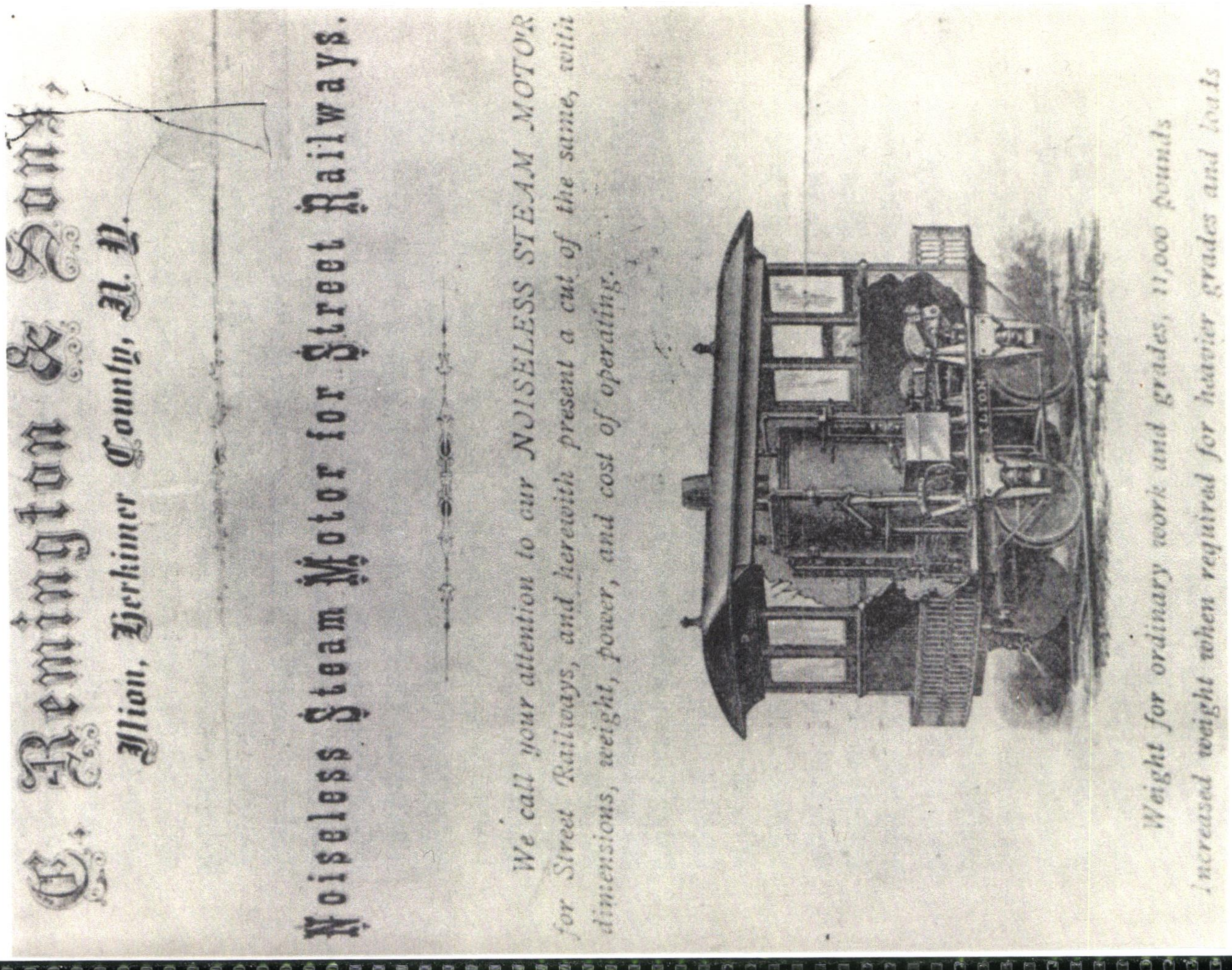
September 28, 1871: The driving portion of the community utter a good many complaints against the street railway track on Hennepin Ave.

October 19, 1871: The city council received petitions from various citizens for removal of the street railway on Hennepin Ave. Referred to the committee on roads and bridges.
October 21, 1871: The city council was considering an order to remove the track from the streets.
December 7, 1871: The city council committee reported the company had failed to operate the track after construction thus forfeited all rights. The council gave the company, at their request, further time to operate the track or remove it.

January 28, 1872: Real estate transfers for the week ended January 27, 1872: Minneapolis Horse Railroad Company to the Minneaplis & St.Louis Railway Company: right-of-way, etc., $5,000.

June 15, 1872 editorial: Two years ago....a mile of track was laid thru the principal avenues, forming a connection between the railroad passenger depots. Cars were run regularly upon this portion of the line for some months. Naturally enough there was no profit to the company in operating so short a route.

June 19, 1873: The city engineer reported that he had taken up the track of the horse railroad on Hennepin Ave., and that he had a notice from R. J. Mendenhall requesting hime to take the rails, etc., of the road from his lot where it had been piled.



E. Remington & Sons,
Ilion, Herkimer County, N. Y.

Noiseless Steam Motor for Street Railways.

We call your attention to our NOISELESS STEAM MOTOR for Street Railways, and herewith present a cut of the same, with dimensions, weight, power, and cost of operating.

Weight for ordinary work and grades, 11,000 pounds
Increased weight when required for heavier grades and loads

MINNEAPOLIS STREET RAILWAY
1873-1874
Compiled from Minneapolis Tribune Articles

There are four articles, July and August 1873, that pertain to the organization of the company. This information does not differ from that previously related.

July 24, 1873: The Remington steam streetcar was shipped from Ilion, N.Y., on July 19th. In order the car may be fully tested before others are ordered arrangements have been made to run it between Minneapolis and Minnehaha on the track of the Milwaukee railroad. The general manager and superintendent of that road having kindly consented thereto.

August 5 and 6, 1873: Refer to the article print-outs on page two which describe two trial runs of the steam streetcar over the CM&StP RR from the Minneapolis depot to Minnehaha.

August 13, 1873: Yesterday the city council so enlarged the privileges of the charter asked for by the Mpls. St. Ry. that Mr. Philo Osgood and his friends were enabled to accept it. We are authorized to announce that the company will begin immediately to lay its track on Third Street at the StP&P RR depot, and will lay it this summer down Third St. and Cedar Ave., 28 squares, to Franklin Ave. (railroad crossing) nearly opposite the fair grounds. Two or three steam streetcars will be put on this route this fall. Next year this line will be extended to Minnehaha, and another will be constructed out to Lakewood Cemetary and in other directions.

August 15, 1873: Wednesday, Philo Osgood, Engineer Cook, and Hathaway (contractor) made an examination of the line between the StP&P RR depot and Franklin Ave.

October 1, 1873: 35# tram rail was ordered some weeks ago.

January 1, 1874: Grading is complete on 3rd St. from StP&P RR depot to 16th Ave. S. and a portion of the rail laid. Work will resume in the spring. Cars will be dummies of the most approved pattern and run by steam power.

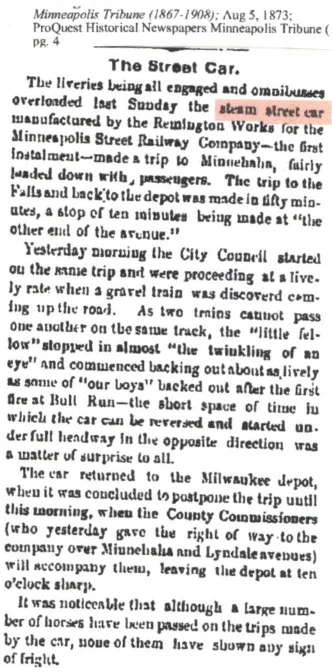
July 11, 1874 editorial: track needs to be completed within one month to meet the terms of the franchise. Iron rail is all on hand, grading is almost done. It will cost but $5 to 6,000 to complete the work. Go on with it!

August 3, 1874: The company asked the city council for an extension of time to complete. Business complications fo the parties interested prevented them from completing the road. The panic of last fall was the cause. They had already expended a considerable amount on the construction of the road.

August 12, 1874: The charter for the street railway company granted a year ago, expired yesterday by limitation. The company made application for an extension, giving what the public considered good reasons for the failure to build the road. The application having been laid on the table by the council, the parties interested in the company will not, they state, make any further application for extension, but, taking up the rails already laid, will abandon the enterprise.

July 28, 1875: The old track on Third Street is being torn up preparatory to its removal to the recently established routes of the [new] line.

In an interview with MSR Supt. Atwood on October 11, 1879, he stated the company had laid track on 3rd St. from the StP&P RR depot to 6th Ave. S.; purchased one car, made almost half-a-dozen trips, then abandoned the enterprise.



Minneapolis Tribune (1867-1908); Aug 5, 1873;
ProQuest Historical Newspapers Minneapolis Tribune (1
pg. 4

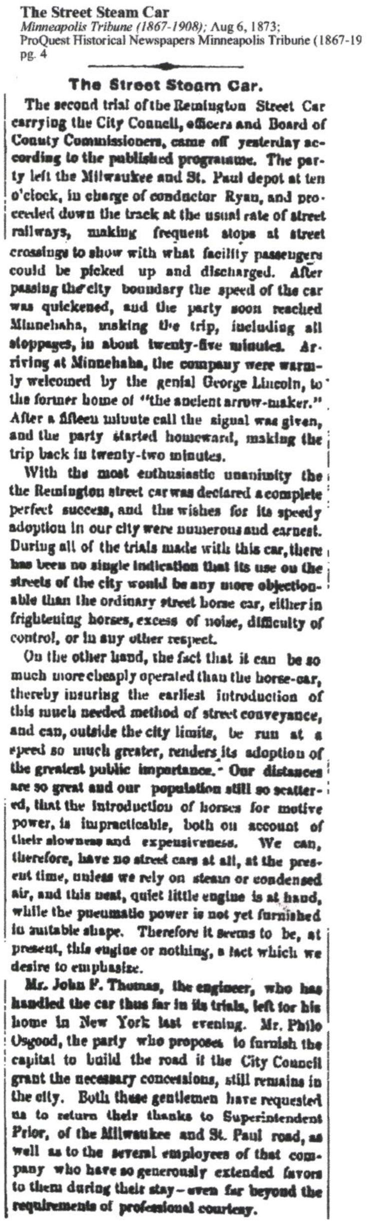
The Street Car.

The liveries being all engaged and omnibusses overloaded last Sunday the steam street car manufactured by the Remington Works for the Minneapolis Street Railway Company—the first instalment—made a trip to Minnehaha, fairly loaded down with, passengers. The trip to the Falls and back to the depot was made in fifty minutes, a stop of ten minutes being made at "the other end of the avenue."

Yesterday morning the City Council started on the same trip and were proceeding at a lively rate when a gravel train was discoverd coming up the road. As two trains cannot pass one another on the same track, the "little fellow" stopped in almost "the twinkling of an eye" and commenced backing out about as lively as some of "our boys" backed out after the first fire at Bull Run—the short space of time in which the car can be reversed and started under full headway in the opposite direction was a matter of surprise to all.

The car returned to the Milwaukee depot, when it was concluded to postpone the trip until this morning, when the County Commissioners (who yesterday gave the right of way to the company over Minnehaha and Lyndale avenues) will accompany them, leaving the depot at ten o'clock sharp.

It was noticeable that although a large number of horses have been passed on the trips made by the car, none of them have shown any sign of fright.



The Street Steam Car
Minneapolis Tribune (1867-1908); Aug 6, 1873;
ProQuest Historical Newspapers Minneapolis Tribune (1867-19
pg. 4

The Street Steam Car.

The second trial of the Remington Street Car carrying the City Council, officers and Board of County Commissioners, came off yesterday according to the published programme. The party left the Milwaukee and St. Paul depot at ten o'clock, in charge of conductor Ryan, and proceeded down the track at the usual rate of street railways, making frequent stops at street crossings to show with what facility passengers could be picked up and discharged. After passing the city boundary the speed of the car was quickened, and the party soon reached Minnehaha, making the trip, including all stoppages, in about twenty-five minutes. Arriving at Minnehaha, the company were warmly welcomed by the genial George Lincoln, to the former home of "the ancient arrow-maker." After a fifteen minute call the signal was given, and the party started homeward, making the trip back in twenty-two minutes.

With the most enthusiastic unanimity the the Remington street car was declared a complete perfect success, and the wishes for its speedy adoption in our city were numerous and earnest. During all of the trials made with this car, there has been no single indication that its use on the streets of the city would be any more objectionable than the ordinary street horse car, either in frightening horses, excess of noise, difficulty of control, or in any other respect.

On the other hand, the fact that it can be so much more cheaply operated than the horse-car, thereby insuring the earliest introduction of this much needed method of street conveyance, and can, outside the city limits, be run at a speed so much greater, renders its adoption of the greatest public importance. Our distances are so great and our population still so scattered, that the introduction of horses for motive power, is impracticable, both on account of their slowness and expensiveness. We can, therefore, have no street cars at all, at the present time, unless we rely on steam or condensed air, and this neat, quiet little engine is at hand, while the pneumatic power is not yet furnished in suitable shape. Therefore it seems to be, at present, this engine or nothing, a fact which we desire to emphasize.

Mr. John F. Thomas, the engineer, who has handled the car thus far in its trials, left for his home in New York last evening. Mr. Philo Osgood, the party who proposes to furnish the capital to build the road if the City Council grant the necessary concessions, still remains in the city. Both these gentlemen have requested us to return their thanks to Superintendent Prior, of the Milwaukee and St. Paul road, as well as to the several employees of that company who have so generously extended favors to them during their stay—even far beyond the requirements of professional courtesy.

MINNEAPOLIS STREET RAILWAY
ORGANIZATION AND MANAGEMENT
Compiled from Minneapolis Tribune Articles.

12-31-1877 The ownership of quite a large amount of the stock having changed and being now held by capitalists in Cleveland and Boston, some changes have been made in the board of directors and management of the company under which all interests are represented. Mr. C. C. Jones resigned his position as a director and officer. Mr. F. D. Robison of Cleveland, Stephen Bowen of Boston, and Col. John W. Henion of this city added to the board of directors. Mr. D. Atwood of Cleveland, a successful railway manager of many years experience, has been elected manager of the company. Mr. Atwood comes into the management highly recommended by those veteran street railway constructors and operators, Messrs. Hathaway & Robison of Cleveland. C. G. Goodrich Jr. was chosen secretary and Col. J. W. Henion, treasurer.

TWIN CITY RAPID TRANSIT CO. ORGANIZATION
Compiled from Minneapolis Tribune Articles

6-5-1891: Articles of Incorporation of TCRT have been files in Elizabeth, N. J. June 4th. Incorporaters are Henry W. Cannon; J. Kennedy Todd [sic]; George Bliss of Morton, Bliss & Company; George S. Coe, president of American Exchange National Bank; all of New York; Thomas Lowry of Minneapolis, and John Kean of Elizabeth. Capital Stock is $70,000,000.

11-5-1878

THE STREET RAILWAY
Minneapolis Tribune (1867-1908); Nov 5, 1878;
ProQuest Historical Newspapers Minneapolis Tribune (1867-1922)
pg. 4

THE STREET RAILWAY.

What the Company Has Done During the Season Just Closing.

A New Line Built and Extensive Improvements Made in the Old Ones.

A New Car House Erected and the Stables Completely Enlarged and Remodeled.

The Number of Men and Horses Employed—The Methods of the Company.

The Minneapolis Street Car company, under the able management of Superintendent Atwood, has done a vast amount of work during the season just closing, and is now in splendid condition. The company has employed on an average not less than fifty hands throughout the summer, and the labor of this force has been so directed as to show a grand improvement in the condition of this important local enterprise.

Among the most notable of these improvements is the construction of the new Fourth avenue line, which adds a mile of track, and nearly two miles of additional service to the lines, affords cheap transportation to a large number of our citizens who have been heretofore remote from the lines of the company, and were forced to walk to and from business, or keep a horse, which to a large proportion of the patrons of the new line was a great burthen.

This line has been equipped with the handsomest cars ever brought into the northwest, and are not excelled in beauty, elegance and completeness in the United States. They are as superior to the average street car as a palace coach is to the ordinary passenger car of a steam railroad.

This new line is so arranged in running time that in connection with the Washington avenue cars it gives a six-minute service between the St. Paul & Pacific and the the Milwaukee & St. Paul depots, a marked convenience, and one that is appreciated by persons having occasion to transfer from one railroad to the other. In addition to this the company has done a large amount of work on the Hennepin and East Side track. The old track across the temporary bridge had to be taken up and relaid upon the new East Side bridge, and the double track through Central avenue had to be replaced with a single track to conform to the action of the Council in ordering a single track across the bridge. The track had to be raised to the new grade rendered necessary by the bridge. The space between the tracks on the bridge has been paved, as has also nearly all the street crossings, and it is probable that next year the entire road will be paved with cobble stones.

The track of the several lines has been put in prime order for the winter, although work upon it will be continued until the frost shall render its prosecution impossible. During the season the company has increased its number of cars to fifteen, and added twenty-five horses to its stable, making a round hundred required to do the business of the several lines. The old cars which have been in use since the organization of the company have been entirely renovated and repainted, and emerge from the shops as bright and in as perfect order as when purchased.

At the stables of the company the improvements are perhaps most noticeable. A commodious car house, capable of accommodating twenty-five cars, has been erected. The building is 65x100 feet, is of brick, and beside the room devoted to housing the rolling stock it has a complete repair shop, blacksmith and paint shops, and waiting room for the drivers. It faces Third Avenue South, near Second street, and a spur track to reach it has been laid from Washington Avenue.

The old car house which was under the same roof with the stables, has been fitted with stalls, adding one-third more room for horses, and the stables of the company are now as near perfect as could be desired. The health and comfort of the animals have been carefully studied, and the most approved sanitary measures have been adopted. The interior is light and airy and the stalls so arranged that in case of fire every animal could be removed in a very few moments. No accumulation of stable litter is permitted, and the building is as free from offensive orders, alike disagreeable and deleterious to the health of employes and horses, as the most fastidious could desire.

The company employs over thirty men, and a hundred horses constantly, and with the proposed extensions this number will have to be materially increased. The average day's work of a horse is twelve miles and of a driver about sixty-five miles. Cars on the Washington avenue and on the Fourth avenue lines run at intervals of twelve minutes, and on the Hennepin and East Side lines at intervals of fifteen minutes.

The management of the road is now in the hands of Minneapolis men, and is run in the interest and for the benefit of Minneapolis, and as such is appreciated by our citizens. It is well patronized, the laboring men of the city forming no inconsiderable proportion of its regular passengers. Night and morning the cars of all the lines are comfortably filled with men bearing the unmistakeable insignia, the dinner pail, and without the patronage of this important element of society the road could not exist.

The managers recognizing this fact take particular pains to meet all reasonable demands of these generous patrons, and cars are run with direct reference to their convenience.

The management is deserving of credit for the excellent condition in which it has put its track and rolling stock, and for the convenience afforded the public.

10-11-1879

OUR STREET RAILWAYS
Minneapolis Tribune (1867-1908); Oct 11, 1879;
ProQuest Historical Newspapers Minneapolis Tribune (1867-1922)
pg. 7

OUR STREET RAILWAYS.

An Interesting Interview with Mr. D. Atwood, Superintendent of the Several Lines.

An Enterprise the Extent of which is Unappreciated even by our own Citizens.

Nine Miles of Road, 95 Horses and 21 Cars—An Average Distance of 34,000 Miles Traveled Monthly.

The Patronage of each Branch—Description of the Car Shops and Stables.

Earnings of the Road for the First Year $24,000, and for the Past Year $45,549.

A SUCCESSFUL ENTERPRISE.

To-day was a rainy, muddy and disagreeable day. About 9 A. M. a TRIBUNE pencil-pusher stood on the rear platform of a Washington avenue car disgusted with life and the prospects of being enabled to furnish a readable "leader" for the local columns of to-day. At this juncture the car turned a sharp curve, a standing passenger suddenly sat down, an hysterical lady made a plunge for a parcel, and an idea and a chunk of wood struck the graphic manipulator all at one and the same time. A duty remained to be performed, and why should life and a small salary be despised? Yes, why should they? Street-cars were an unappreciated blessing. Had it not been for the street cars those poetic gems, those brilliant contributions to the late current literature would never have been known, and could never have been handed down to future generations as a specimen of the fine frenzy that burned in the brain of the æsthetic and poetic genius of to-day. The inspiration that resulted in the penning of that beautiful poem first revealed itself to its famous author while riding in a street car. Its smooth, perfect rythm can never be forgotten and as a delicate and tender memory of the past we append the first stanza:

"Punch, brothers, punch with care,
Punch in the presence of the passenjaire,
A pink trip-slip for a three-cent fare,
A blue trip-slip for a five-cent fare,
And all in the presence of the passenjaire."

Here then a was duty to be performed. The street car should be recognized, not only as a subject of inspiration but as one of the best appreciated and most successful enterprises of this successful and enterprising city. None would know more about it than Superintendent Atwood, and to his office the news-seeker hastened, after first jotting down the following preliminary statement:

The articles of incorporation of the first street railway company ever formed in Minneapolis were filed on the 23d day of June, 1873, the incorporators being Messrs. D. Morrison, H. J. Mendenhall, W. W. Eastman, W. P. Westfall, R. B. Langdon, William S. King, J. G. Oswald, W. W. McNair and Paris Gibson. This corporation provided for the issuance of $250,000 of stock in shares of $250 each, and was to continue for a period of fifty years. The company laid a track from the Pacific depot down Third street to Sixth avenue south, purchased a car, and abandoned the enterprise before an half-dozen trips had been made. The privileges granted by the city under this charter were renewed from time to time until the summer of 1875, when all of the privileges and rights of the old company were secured by Hon. Wm. S. King and Thomas Lowry, of this city, Messrs. Philo Osgood, F. C. Shepherd and James Tuckerman, of Ilion, N. Y., and A. H. Prescott, of Herkimer, N. Y., a body of men who meant business. This company immediately built a line of road from the Pacific depot to the East Division, and purchased five or six cars, the first of which ventured forth on its inaugural trip on the 2d day of September, 1875. Shortly afterward the Washington avenue line was constructed, then followed the Hennepin avenue line, and at last the Fourth avenue. The enterprise proved a success from the very first, and was under the management of Mr. Jas. Tuckerman, until the 2d day of January, 1878, when Mr. D. Atwood, the present superintendent, took charge.

Being duly charged with interrogation points the reporter rapidly fired them at Superintendent Atwood, and received in return the following statistical and historical declarations which were duly booked for the information of TRIBUNE readers:

At the time I accepted the superintendency of the road, Jan. 1st, 1878, the company owned and operated seventeen cars and sixty-five horses. We now have twenty-one cars and ninety-five horses. Seven of these cars run daily on the Washington avenue line, six on the Hennepin avenue and East Division line and four on the Fourth avenue line, leaving at present a reserve of four, one or two of which will very soon be put upon regular trips. The Washington avenue line, extending from Franklin avenue to Plymouth avenue, is about three and a half miles long; the Hennepin avenue line, from the State University, E. D., to Sixteenth street, W. D., about three and a quarter miles, and the Fourth avenue line, from the Pacific depot to Twenty-fourth street, two and a half miles, making about nine miles altogether. To this may be added one and a quarter miles of double track and several sidings which together would make a total of eleven miles of iron.

Reporter—How many men are employed by the company?

Supt. Atwood—There are thirty-four on our regular pay-roll, although counting track repairers it often counts up as many as fifty. We have nineteen drivers receiving on an average $35 per month. Each driver has a "day off" every eighth day.

Reporter—What hours are the drivers on duty?

Supt. Atwood—The first car leaves at 6 A. M. and the last car is in at 11 P. M. Then there are extra trips and hours on the evenings of entertainment.

Reporter—I think I saw a paragraph one day stating how you estimated the number of cars for entertainments.

Supt. Atwood (laughing)—Yes, but I never intended that should be published. I simply made the remark, and some enterprising TRIBUNE news-seeker captured it. You see, when there is to be a first-class lecture or scientific entertainment, I have learned by experience to send out an extra number of Hennepin and Fourth avenue cars. When there is a circus performance or minstrel show the demand for "extras" comes from the Washington avenue line, and when a free lecture or entertainment is announced then we have to provide the same for the East Division line.

Reporter—Tell us something about the cars and horses.

Supt. Atwood—Every car is provided with five horses, the same ones always being used. Each horse makes two round trips one day and three the next, besides the "extras," which gives an average travel of 14 miles per day for each horse, and from 72 to 84 miles per day for each car. Our total mileage for August was 34,000 miles, and it was not an exceptionable month either. The life of a car is from eight to fifteen years, and we do not keep a horse in service as a usual thing for more than six years.

Reporter—Which line pays the best?

Supt. Atwood—The Washington avenue is at present the best paying route, and gives the most certain daily average.

Reporter—Have you any objections to stating the total earnings of the several lines for the past year?

Superintendent Atwood (turning to the books)—Certainly not. The record is a good one and the gradual and steady increase visible in each day's receipts gives us an assurance of continued prosperity, and affords something of an index to the growth of the city. The receipts for the first year, 1875 to 1876 were, in round numbers, $24,000, and for the past year, from Sept. 1st, 1878, to Sept. 1st, 1879, $45,549. Divide that by four and a half and you will have the number of paying passengers carried.

At this point Superintendent Atwood suggested a visit to the car house and stables, which invitation was promptly accepted.

The car house is a brick structure, 65x100 feet, six tracks running the entire length of it. A transfer platform enables the cars to be easily transferred from one track to another. To the right of the main entrance is the "boys room," comfortably fitted up. Here the drivers smoke their cigars, and while waiting for an entertainment to close, or an extra trip, crack jokes and relate amusing incidents of their trips. One will tell about a horse that wanted to be balky, another related an incident of a passenger who put a $1 bill into the box and waited for his change, while the third always comes in with the most astonishing story and most ludicrous incident. Near the boys' room is the coal house, and in the rear of the building the blacksmith shop where all of the repairing and horseshoeing is done.

The stable is located corner Second street and Fourth avenue north, and was found by the reporter to be a model of perfection. The structure is 80x100 feet, the first floor being entirely occupied by stalls and mangers, ninety-five in number. The walls and joists are neatly whitewashed, the flooring of the stalls are covered with sawdust, and the arrangement is such that a most perfect ventilation is secured. No manure is allowed to accumulate, it being carried out of the city limits every morning. The five horses for each car are in a row by themselves, and each horse possesses a collar which hangs on a peg at the rear of his stall. The remainder of the harness is used in common by each horse, two sets of harness being furnished each car. Each horse also has its own water pail and sponge and as soon as it returns from a trip its feet and legs are carefully cleaned and sponged. Mr. Atwood acts as veterinary surgeon, and at present every horse is in a good, healthy working condition.

Reporter—How many men are required to care for the horses?

Supt. Atwood—One man cares for ten horses, grooming and harnessing them for their trips. One man only is required to do the feeding, so perfect is our system. The horses are fed at 5 A. M., 7:30 A. M., 11:30 A. M., 3:30 P. M., and 7:30 P. M. Each horse consumes on an average 9½ pounds of hay and 18 pounds of grain per day. My policy is to give the horses all they will or can eat. During the month of August we fed 18 tons of hay, 17 tons of ground feed and 131 bushels of oats. All of the hay is cut by our horse-power hay cutter before feeding, and with the hay we feed clear oats and oats and corn ground, in the proportion of eight of corn to ten of oats.

A further inspection of the hay and straw lofts and the entire building furnished convincing proof that the management of the details of the business and the buildings and conveniences were as near perfection as could be possible, and the reporter, with many thanks, bid adieu to the genial superintendent, and hied himself away to the office of Thomas Lowry, the president of the road, in order to ascertain any future plans that the company might be about to develop for the convenience of the public and for the prospective increase of dividends.

Mr. Lowry assured the newspaper representative that everything was in a satisfactory and prosperous condition, and had nothing to add to Superintendent Atwood's remarks, except the statement that no new lines or extensions would be made this year. Next year, however, Mr. Lowry was confident that a new line would be built, but the most persistent inquiry and the bringing to bear of all the arts of the interviewer failed to secure any satisfactory statement or even hint as to its probable location.

The duty was performed, and the Bohemian pocketed his pencil and hastened to his hash house.

11-10-1883

OUR STREET CARS
Minneapolis Tribune (1867-1908); Nov 10, 1883;
ProQuest Historical Newspapers Minneapolis Tribune (1867-1922)
pg. 7

OUR STREET CARS.

SEVEN MILLION PEOPLE CARRIED BY THEM LAST YEAR.

A Revenue of a Thousand Dollars Per Diem Collected—A St. Paul Extension Contemplated for Next Year—Other Additions Planned.

According to the statements of the officers of the Minneapolis Street Railway Company, the seven lines operated by that company during the year ending Nov. 1, collected fares from 7,000,000 passengers. During the months since the beginning of spring the number has increased; the monthly average has been from 65,000 to 70,000, which for a year would make the total between 8,000,000 and 8,500,000. Certainly, no other interest in the city, or in Minnesota has so many customers. The receipts for some of the separate days were large, the travel on a pleasant day sometimes aggregating 25,000 people. The largest single day's receipts in the history of the road were taken on Barnum's circus day, when 70,000 passengers rode. If it be calculated that each made two street car trips that day, it may be said that fully one third of the entire population of Minneapolis put their "exact fare in the box" on that day.

THESE FIGURES

almost stagger one to think of. The number of miles these 60 cars travel, if stretched into one line, would girdle the earth in five days' time, and the continual dropping of tickets and nickels into the boxes makes an aggregate of about $1000 per day, which in times of heavy travel amounts to two or three times that sum.

In order to accommodate this traffic the company operates 35 miles of track and 105 cars, 61 one of which are in constant use during the day, besides which extra cars are run nights and mornings on four lines.

The several lines of the city run as follows:

Cedar avenue line, extending from Nineteenth avenue north, along Washington to Sixteenth avenue south, to Franklin avenue. Cars start from each end of the route every 5 minutes, and it requires 1¼ hours to make the trip.

The Broadway and Monroe street line, from Western avenue to Broadway and Fourteenth street, starting every 10 minutes, 1 hour being occupied in the run.

The University avenue line, from the university to Hawthorne avenue, to Sixteenth street every 9 minutes, consuming 80 minutes on the trip.

The Fourth avenue line, every 6 minutes, from the intersection of Third avenue north and Washington avenue, to Fourth avenue, to Twenty-fourth street. Fifty minutes is the time allowed for the trip. Cars on this line to the extension depart from Third avenue north and Washington avenue every 12 minutes.

The Riverside line, every 7 minutes from the corner of Third avenue north and Washington avenue, and 50 minutes is the schedule time in which the trip is made.

Eighth avenue line, from the corner of Third avenue north and Washington avenue every 10 minutes to Chicago avenue, to Franklin avenue. The schedule time is the same as that of the Fourth avenue and Riverside lines. The fare on each of these lines is 5 cents.

Supplementary to the above provisions the company has erected eight stables, car houses, shops, storerooms, etc., all of which are substantially built and represent large investments.

FUTURE EXTENSIONS.

In conversation with Mr. Thomas Lowry, the president, yesterday, that gentleman stated to a TRIBUNE reporter that the additional track, the construction of which is contemplated next year, has not yet been mapped out. The Riverside avenue line will be probably extended beyond the present terminus, to a point somewhere near the railway shops, but on which street had not been determined. It may be, too, that a line will be pushed out on Cedar avenue or Minnehaha street. In regard to the St. Paul connection, Mr. Lowry stated that the plans had not been consummated. Three lines for it had been surveyed, on one of which the track would be laid, but Mr. Lowry was not yet prepared to say which one. There was no call for a line to Fort Snelling, and none would be built. It was not probable that extensions in addition to those above indicated would be built in this city. One was contemplated for the Oak Lake addition, but it is not loudly called for as yet, and will probably not be built until a railroad viaduct is built at Third street.

The extensions and improvement made this year will cost in the neighborhood of $288,000, and those in contemplation for 1884 will not cost less than $300,000. The Lyndale extension will not interfere with the present Twelfth street and Hawthorne avenue line which will be operated as at present. Among the recent stock purchased by the company are five car loads of T railroad iron for use inside the car barns.

Mr. Lowry stated that the accommodations for street cars on Hennepin and Washington avenues were pretty well crowded, in consequence of which it would be inexpedient to build many more lines or operate many more cars at present, so that people who clamor for street car lines to run on the streets on which they live, will have to be patient for a time. "They are not all reasonable about it, however," said he. "In compliance with the request of patrons of the Eighth avenue line, I run their cars on Sixth street past the Grand Opera House. But they are now complaining that they have to walk four blocks from Sixth street to Washington avenue and have petitioned me to make another change, which of course I cannot do."

The business of the company has enlarged recently of late to such an extent that it has been compelled to enlarge its headquarters, and yesterday moved into its new offices in the Academy of Music building, occupying eight spacious, finely furnished and tastefully ornamented rooms on the second floor.

1-1-1882

THE STREET RAILWAY
Minneapolis Tribune (1867-1908); Jan 1, 1882;
ProQuest Historical Newspapers Minneapolis Tribune (1867-1922)
pg. 11

THE STREET RAILWAY.

A Complete and Well-Managed System now Including 21 Miles of Track.

Passengers Carried in 1881, 2,471,178—Total Earnings, 8803,559—For 1881, 8115,000.

New Lines to be Constructed in 1882—8161,000 to be Expended—Other Improvements.

FARE FIVE CENTS.

The Minneapolis Street Railway has shared in the general prosperity of this city to a gratifying extent since the organization of the company by which it is owned, in 1875. President Lowry informs THE TRIBUNE that the receipts from all sources up to date amount to $803,559.25, all of which has been invested in the extension of the system. No dividends have been declared, but the receipts have enabled the company to construct and equip a

LINE OF STREET RAILWAY

which, with the exception of the street railway system in New York, Chicago and Boston, has no superior in the United States. When the prospective improvements and extensions are completed, it is claimed that the road will have no equal in America. The capital stock of the company is $1,000,000.

The road began operations on September 2, 1875, with only two lines of track, the Plymouth and Cedar avenue line, and the University and Hennepin avenue line, a total distance of about five miles.

During 1881 the company constructed five miles of new track, a portion of which was paved with cobble-stones. Three barns and three car-houses were erected. Their present equipment includes six barns, six car-houses, fifty-four cars, with a working force of 135 men and 265 horses. The improvements made in 1881 cost $125,000. The

NUMBER OF PASSENGERS

carried amounted to 2,471,178, earning, in round numbers, $115,000. Twenty-one miles of track have been constructed. Within the current year the amount of track will be increased to nearly thirty miles.

The estimated cost of proposed improvements to be completed in 1882, is $161,000. These improvements will include three barns and as many car-houses. Twenty cars, of improved construction and elaborate finish, have been ordered, and it is probable that twenty-five more will be needed to enable the company to carry the 4,000,000 passengers who are expected to patronize the road during this year. This expected

INCREASE IN TRAVEL

is based upon a low estimate of the proportion of people who will be accommodated by the new lines to be constructed, without reference to the rapid and constant increase of population, which in all probability will swell the total another million. It is hardly to be expected that 100 cars will be adequate, when the extensions are completed, to accommodate the thousands who daily patronize this convenient and economical means of transit.

The construction

OF THE NEW LINES

will be commenced as soon as practicable next spring. In the East Division a track will be laid from Fourth street along Central avenue to Seventh street, and on Seventh and Monroe streets to the Webster school building.

The Western avenue line will be extended from its present terminus at the Holden street bridge, through Oak Lake addition, a distance of about three-fourths of a mile.

A double track will be constructed on the University and Hennepin avenue line, from Twelfth street, on Hennepin to Fourteenth avenue southeast. An additional track will also be constructed along the entire length of the Plymouth and Cedar avenue line, and also on the Fourth avenue line. This improvement will greatly increase the usefulness of these lines, preventing the annoying delays in waiting at switches to pass belated cars.

Every rod of the tracks in the city will be

PAVED WITH COBBLE STONE.

Workingmen are now engaged in preparing the necessary material.

The officers for the road are: "President, Thomas Lowry; vice-president, Clinton Morrison; secretary, C. G. Goodrich; treasurer, W. W. Herrick; who, with W. W. McNair, compose the board of directors.

President Lowry states that the road will be extended and improved to keep pace with the growth of the city, and that

NEW LINES WILL BE BUILT

and extended wherever the wants of the residents and patrons demand. It may be expected from this that within a few years the line will be one of the most extensive in the country, as it certainly will be when the improvements now in hand are completed, before the close of this year, the best constructed and equipped.

1-1-1883

THE STREET RAILWAY
Minneapolis Tribune (1867-1908); Jan 1, 1883;
ProQuest Historical Newspapers Minneapolis Tribune (1867-1922)
pg. 9

THE STREET RAILWAY.

A Well Organized and Extensive System—Improvements Made in 1882—Extensions Projected—The Elevator and Machine Shops—Large Additions in Equipment Required.

The principal extensions of the street railway system during the year have been, with the exception of the Monroe street and Broadway line, continuations of lines already in operation, In connection with these, extra tracks were laid where most needed, with the design of ultimately giving each line an entire double track. thus obviating the necessity for switches.

HISTORICAL.

The road began operations Sept. 2, 1875, with only two lines of track—the Hennepin avenue and University line and the Plymouth and Cedar avenue line—a total length of five miles. The capital stock of the company is $1.000,000, and the earnings, since opening business will nearly reach that. The traffic of the road nearly doubled in 1882.

The extra track laid during the year is located:

On the Hennepin avenue and University line on Fourth street southeast, extending from Central avenue to the university terminus, and on Hennepin avenue from Washington avenue to Fifteenth street.

On the Cedar avenue line on Washington avenue from Thirteenth avenue to Nineteenth avenue north.

On the Riverside avenue line, on Washington avenue, from Eighth avenue south to Twenty-fourth avenue south.

The Monroe street and Broadway line was opened for passengers in the early fall, extending from the corner of Fourth and Central avenues, East Division, up Monroe street and Broadway, through Beard's new additions to Sandy lake, a distance of three miles from the Boston block, the western terminus from which cars run.

Eight miles of track were paved during the year.

Including the sidetracks the mileage constructed during the year is nearly 20.

PROSPECTIVE IMPROVEMENTS AND EXTENSIONS.

Next season the double track system will be made complete by the construction of six and one-half miles of track.

A double track line will be built from Hennepin avenue down Sixth street to Eighth avenue south, thus connecting the Grand Opera House with the entire street railway system.

The remainder of the road will be paved next season.

The completion of the double tracks will give a total mileage of 38 miles.

The present equipment comprises 340 horses and 69 cars.

Twenty cars and 120 horses were purchased during the year.

Three stables and car houses were built during the year—located at the corner of Franklin and Chicago avenues; corner of Nineteenth and Washington avenues north, and at the corner of Monroe street and Broadway, East division.

The business of the coming year will require the purchase of 39 new cars, which have been ordered. Cars will then leave terminal points every five minutes instead of 10 as now. One hundred and twenty-five horses will be bought, and two additional barns and car houses will be erected.

AN ELEVATOR

of 140,000 bushels capacity was erected for the storage of grain for the horses employed, and the company also owns a feed mill. A machine shop is situated in the basement of the elevator, which is located at the corner of Fifth street and Third avenue north, the repair shop being at the corner of Third avenue and Second street north. Their machine shop has been thoroughly equipped with machinery for the purpose of building the company's own cars. The expenditures of the street railway company for permanent improvements during the past year may be summarized as follows:

Sixteen and a half miles of new track.	$82,500
Three new stables	32,000
Eight miles of cobble stone paving	12,750
Elevator enlargement	25,000
Thirty new cars	54,000
Horses for increased service	15,000
Total	$221,250

Among the possibilities of next season's operations may be the construction of one or two new lines or extensions, but these are by no means certain, as plans are undeveloped and will depend upon exigencies that may arise.

During the year 4,290,438 passengers were carried, in comparison with 2,471,178 in 1881, and the earnings were largely in excess of 1881.

The roadbed, the excellent condition of the track, the equipment and the valuable and convenient accessories of the handling and management of the line combine to make this one of the best street railways in America.

12-31-83

THE STREET RAILWAY
Minneapolis Tribune (1867-1908); Dec 31, 1883;
ProQuest Historical Newspapers Minneapolis Tribune (1867-1922)
pg. 15

THE STREET RAILWAY

Improvements During 1883—Over $300,000 Expended—Extent of the System—Rapid Increase in Its Business.

The Minneapolis Street Railway Company began operations Sept. 2, 1875, with only two lines of track—the Hennepin avenue and University line and the Plymouth and Cedar avenue line, a total length of five miles. The capital stock of the company is $1,000,000, and the earnings since opening for business will considerably exceed that amount. The following are the officers of the company:

President—Thomas Lowry.
Secretary—C. G. Goodrich.
Treasurer—T. J. Baxton.

The company operates 31 miles of track, owns 105 cars, 62 of which are employed daily, employs 359 men, and owns 435 horses. The second lines of the city run as follows:

Cedar avenue line, extending from Nineteenth avenue north, along Washington to Sixteenth avenue south, to Franklin avenue. Cars start from each end of the route every 5 minutes, and it requires 1¼ hours to make the trip.

The Broadway and Monroe street line, from Western avenue to Broadway and Fourteenth street, starting every 10 minutes, 1 hour being occupied in the run.

The University avenue line, from the university to Hawthorne avenue, to Sixteenth street every 9 minutes, consuming 60 minutes.

The Fourth avenue line, every 6 minutes, from the intersection of Third avenue north and Washington avenue, to Fourth avenue, to Twenty-fourth street. Fifty minutes is the time allowed for the trip. Cars on this line to the extension depart from Third avenue north and Washington avenue every 12 minutes.

The Riverside line, every 7 minutes from the corner of Third avenue north and Washington avenue, and 50 minutes is the schedule time in which the trip is made.

Eighth avenue line, from the corner of Third avenue north and Washington avenue, every 10 minutes to Chicago avenue, to Franklin avenue. The schedule time is the same as that of the Fourth avenue and Riverside lines.

The Sixth street line from Hennepin avenue down Sixth street to Eighth avenue south, thus connecting the Grand Opera House with the entire street railway system.

During 1883 track has been laid as follows:

North on Nineteenth avenue to Forest Hill.

A double track on the Broadway and Second street line.

On Sixth street from Hennepin avenue to Eighth avenue south.

Three miles on the Lyndale line.

Aggregating 12 miles of new track.

The expenditures for improvements during the year have been as follows:

For real estate	$105,000
For horses	36,000
New track	26,000
For cars	60,000
New track	75 000
Machine shops	5,000
Snow plows and sweepers	4,000
Total	$311,000

Twenty-five miles of paving between tracks has been done during the year. The company owns eight barns, all of which have been enlarged since Jan. 1.

During the year about 8,400,000 passengers have been carried, the receipts averaging about $1000 per day, or $365,000 a year.

The largest single day's receipts in the history of the road was on Barnum's circus day in September, when 70,000 passengers were carried.

The improvements for next year are not mapped out. There will, however, be a further extension of the Lyndale line and the proposed shops and barns in Windom's addition will be erected. Mr. Lowry thinks the expenditures for improvements next year will equal if they do not exceed those of last year.

Some idea of the growth of the business of the company may be gathered from the following statement of passengers carried the past three years:

Year.	Passengers carried.
1881	2 471,178
1882	4 290,438
1883	8,400,000

The figures for 1883 are necessarily estimated so far as concerns the past few days. At the end of October, however, over 7,000,000 passengers have been carried, or a monthly average of 70,000, which for the year would make the total 8,400,000.

The roadbed, the excellent condition of the track, the equipment and the valuable and convenient accessories for the handling and management of the system combine to make the system one of the best in the country.

ST. PAUL CITY RAILWAY: Nine Miles of Track--Two Round Trip Routes of Seven Miles Each-

Minneapolis Tribune (1867-1908); Oct 18, 1880;
ProQuest Historical Newspapers: Minneapolis Tribune (1867-1922)
pg. 2

ST. PAUL CITY RAILWAY.

Nine Miles of Track—Two Round Trip Routes of Seven Miles Each—Large and Well Appointed Stables and Shop Buildings.

The Street Railway company of St. Paul, having this year laid about four and a half miles of track, has now about nine miles of track in operation, including two main lines of about three and a half miles each. One of these lines is from Ann street by Fort, Third, Wabashaw, Fourth, Sibley Seventh, Willius, etc., to Lafayette avenue; the return track being by Eighth Jackson, Fourth and Fort streets. The other main line is from Ashland avenue on Western, Nelson and Summit avenues, Wabashaw, Fourth, Sibley, Seventh, Broadway and Mississippi streets to the round house; the return being by Mississippi, Grove, Pearl, Jackson, St. Peter, etc. Double tracks are laid on the same street for only a part of either route, the intention being to make the out trip by one route of streets and the in trip by another. The round trip on eac route is made in about one hour and te minutes, the cars following each other a intervals of about eight minutes. The service employs at present 14 cars, 125 horses and 35 men. The new cars (double) which are now on the Western avenue and Mississippi street route, are the finest in all details of any in the street railway service. The whole lines are carefully constructed, most of the old lines having been relaid this season and the cars run with a freedom from jar which is gratifying to passengers. At the corners and crossings and in front of engine houses the right of way has been paved with wooden blocks, so as to save engines and carriages from damages. Other details of improvements might be mentioned which have been made, but it will suffice to say that all the lines are in excellent working order and that the service is about as near perfect as it could be made.

After the roadway and service, the new buildings of the company are worthy of mention. There are two three-story, substantial brick buildings on St. Peter street, from Fourth to Fifth streets, occupying a space of 50x100 feet, all under one roof. The building fronting on Fourth street, first and second floors, is occupied by the the horses, except that there is a waiting room for passengers at the street corner on the first floor, and the manager's office over it on the second floor, both neatly furnished rooms. The third story of this building is for the storing and handling of hay, feed and grain for the horses. Between the two buildings, on the St. Peter street side, in front of the covered and enclosed passage ways connecting the buildings, is a large hoisting platform, for raising cars to the second story of the car building and for raising feed and hay to the third story of the stable building. Farmers who bring loads of hay to the stables are surprised, after following direction to drive onto the platform and unhitch their horses, to see wagon and hay hoisted up until they can pitch the hay downward into the hay-loft; but having learned how the hoisting apparatus lightens the labor of unloading they afterwards prefer to sell their hay to the car company. The elevator is at present worked by hand power, but with it two men can hoist at the same time a street car and a wagon loaded with hay. The second or car building provides on the first floor track room for sheltering all the cars at night. A blacksmith shop on the same floor does all the horse shoeing and all the iron work for repairs of the company. The second floor is devoted to car repairs and car painting; and the third floor is taken up with the sleeping rooms and assembly room of the employes, while on the roof provision is made for airing and drying their clothes.

All in all the St. Paul City Railway is an institution creditable to the city, while the condition of the property and completeness of the service are to be credited to the good judgment and untiring care of the manager, Mr. James K. Walsh, who has made it profitable to the owners, and eminently useful to the public.

ST. PAUL NEWS: The Opening of the Grand Avenue Electric Railway Six Trains Successfully Carry the
Minneapolis Tribune (1867-1908); Feb 23, 1890;
ProQuest Historical Newspapers: Minneapolis Tribune (1867-1922)
pg. 3

ST. PAUL NEWS.

The Opening of the Grand Avenue Electric Railway.

Six Trains Successfully Carry the Company's Guests of the Day.

Speeches Are Made by Archbishop Ireland and Others.

A Talk with Private Wild—Other Interesting News Matters.

The chief event in St. Paul on the anniversary of Washington's birthday was the formal opening of the Grand avenue electrical motor line. Early in the forenoon the street cars running to the Ramsey street barns were crowded with people going to see the new electrical cars start upon their initial trip. The start was to be made from the corner of Smith avenue and Forbes street at 11 o'clock and long before that hour hundreds of citizens had gathered in that vicinity to witness an event which would significantly mark the progress of a great city. Six trains, each consisting of a motor and a trail car, were standing on the tracks near the Ramsey street barns ready to receive the invited guests of the street railroad company. Only those holding invitations were allowed to board these six trains, but they were, nevertheless, very much crowded. Over a hundred people crowded upon the first train and fully as many as seventy-five boarded each of the following five trains. Prominent among the citizens on the first train were Archbishop Ireland, Governor Merriam, Aldermen Sanborn and Sullivan, Mayor Smith, Judge Kelly, John W. Roche, S. S. Eaton, City Engineer Rundlett, William M. Bushnell, Edward J. Hodgson and William Pitt Murray. The first train started shortly after eleven o'clock, followed closely by the others. The six trains sped westward to the terminus of the line without the slightest mishap, at some points attaining a speed of at least 15 miles an hour. At Macalester Park a large number of the students of Macalester College were in line alongside the track and heartily cheered

THE ELECTRICAL TRAINS

as they went by. At Groveland Park, the western terminus of the line, a large platform had been erected and, soon after the arrival of the trains, it was surrounded by hundreds of enthusiastic citizens. Thomas Cochran soon made his appearance upon the platform, followed by Archbishop Ireland, Gov. Merriam, Mayor Smith and a score of other prominent citizens. Mr. Cochran, who acted as chairman, introduced Archbishop Ireland, who made an eloquent address appropriate to the celebration of the opening of the first electric street railroad in St. Paul. He said:

It is well to celebrate on similar dates auspicious events. The memory of one lends strength and inspiration to the other, and the enthusiasm of the day is warmer. We honor this morning the birthday of George Washington. How much we owe to the 22d of February 158 years ago. We owe to it the liberty of our country and the wondrous prosperity of this country which depends upon its liberty. The 22d of February, 1890, will be for St. Paul and Minnesota a historic date. The electric motor is here. It has triumphed over all difficulties. Soon will it speed over all the thoroughfares of St. Paul, carrying our people to the fresh air and health of suburban homes. And in widening the territorial area of our city, widening also its hopes and prospects.

It will shoot out across the Mississippi, into the heart of

OUR NEIGHBORING CITY,

binding it to us by iron bands and the fervent ties of stronger friendship. It will suggest frequent visits of the people of one city to those of the other, and frequent visits increase the love which will lead to the long wished for wedding. Electricity will do more than move our cars. It will be the omnipresent and effective power as will move the machinery of the most ambitious industry. It will penetrate into the hearts and veins of our citizens. Give them unwanted energy and enterprise. The dual city will become a giant in life and promise, and its bountiful hands will reach out to Minnesota, distributing gifts to villages and foreign lands, stimulating Minnesota products and making Minnesota geographically the central state of the coming future republic, the pivot upon which will turn the life and strength of all nations.

Electricity! We hail thee, mysterious power, unknown to our fathers, the harbinger of a new world. No discovery made by man is as pregnant of wondrous results as that of this invisible fluid. As yet we have barely glanced at it. We know but few of its laws. We can use but few of its powers. It brooks no undue and reckless familiarity. Before it we are awe-stricken, and our souls, our eyes in silence worship the great master of all things. Who but the Omnipotent and All Wise scattered through earth and air this mysterious fluid, submitting it to laws that guard it from disrupting all nature, and which, as they are unknown to us, make it beneficent to man.

AN EDISON IS A GENIUS

because he discovers a few of these laws. Was there no supreme intelligence in shaping them? Would he trust to chance in dealing with batteries and charged wires? Is it chance that governs and serves the world?

But whence all the electricity needed to build up the great city of the future, as I have described Minneapolis and St. Paul? A great deal is needed, especially when we ascribe to it the wakening up to proper life and energies some of the citizens of those cities. Well, we have it. Hard by rolls the mighty Mississippi. The spray and foam bubbling over its bosom, conceal in unspeakable quantities the mighty fluid. Soon amidst smiles and blessings we will dam the Mississippi, gathering to one spot its powers, and electricity is ours, as much as we may call it into requisition. Tread reverently upon this ground. It is midway, the very heart of the coming great city. Look at it! Admire it! Has not Providence been generous to it! No wonder that friends of mine across the river covet it. It is the precious gift by which St. Paul will woo and win fair Minneapolis. I was told to speak on the part of the promoters of this enterprise. The franchise under which the Grand avenue electric line has been built came forth from our city council as the Cochran-Ireland franchise. The names are those of men modest and unassuming. They will say for themselves today merely that they are rejoiced at their success, forgive all opposition ever made to them and bid their fellow citizens emulate them in other parts of our city. They thank in a special manner the St. Paul City Railway Company, its president, Thomas Lowry; its manager, Col. Barr, and its superintendent, Mr. Scott. Without the city railway company this line would never have gotten beyond the paper upon which its promoters wrote its name. It is the first born of the St. Paul City Railway Company. Whatever lines it may own in the future they cherish with its fondest love, Grand avenue.

The archbishop closed by thanking the city council for the franchise and the citizens for the bonus raised.

Gov. Merriam was the next speaker. He said the event was another round in the ladder of the industrial growth of the city. Since the birth of Washington a marvelous change had come over this country, one which had

NOT ONLY TRANSFORMED

its face, but one which had gone deeper and changed its form of government. The future looked bright, but who can see the condition of this midway district 20 years hence.

Mayor Smith said: "Less than one year ago Archbishop Ireland and Hon. Thomas Cochran conceived the idea of building an electrical line to connect our suburban homes with the heart of the city. They met with opposition from unexpected quarters, but finally, by their persistent energy and determination, obtained a franchise, and behold the result in an incredibly short time. All honor to those public-spirited gentlemen. Their names will be handed down to posterity as public benefactors. This is but the entering wedge of enterprises reaching out their arms in every direction from the center of our city to our suburban homes; our city is on the dawn of brighter days of great prosperity; we will soon be a city of householders in name and fact."

D. R. Noyes, speaking in behalf of the chamber of commerce, said:

After listening to such high authorities in the church and state as Archbishop Ireland and Mayor Smith, it is a little difficult no doubt to come right down to business, but it must be so. The chamber of commerce has unified and protected our interest. It has aided most effectually in settling the late unpleasantness in the street railway matters and in giving us the Grand avenue line today. It needs no prophet to foretell that the days for horse cars for our city is nearly past. We have but begun to utilize this subtile and dangerous force that is to play such an important part in the future of our city. If the old settler could return to St. Paul and note the new houses now covering his acres of old he would no doubt desire to stay here and enjoy the benefit of our widespread prosperity. I expect much from the success of the day, not only from this line, but from the others which will follow. The rich and the poor are benefited in such an enterprise as this. It enables anyone to secure a home outside of the line of too great expense. The chamber of commerce tends to you gentlemen, progenitors and proprietors of this new line, its sincere thanks and heartily congratulates you upon your success."

Aldermen Sanborn and Sullivan made brief speeches on behalf of the city council, after which the entire party adjourned to tents in Groveland Park and enjoyed a delicious lunch. The return trip to the Ramsey street barns was made without an incident to mar the success of the opening of the line. The cars will not run into the business of the city for several days yet, on account of a defect in the wires at the corner of Wabasha and Seventh streets.

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following history of Minneapolis Street Railroad will doubtless prove of considerable interest. The earlier history of the St. Paul City Railway company and its predecessors is shrouded in considerable mystery, and there are really very few citizens of the St Paul of to-day who have an accurate knowledge of the beginning of street car service in the city. The system of to-day, crude as it may be, is the product of an evolution which has been going on almost exactly seventeen years. The first cars on the first line began to move in August, 1872, and there were just four cars, with four drivers and four horses. This with a line of track extending from Seven Corners, down Third to Wabasha, over to Fourth, down Fourth to Jackson, up to Seventh, on Seventh to Locust and out Locust to the corner of Lafayette avenue and Westminster street. The charter under which this road was operated and which is substantially the one under which the company holds its rights to-day was the third granted, nothing having been done under the first two. One was granted by the territorial legislature of 1857 and called for a road operated by steam, to start in St. Paul and run in the direction of St. Anthony Falls. The next was granted in 1868 and this, revised and amended, passed the city council in 1871 and was ratified by the legislature of 1872. Under it, the St. Paul Street Railway company was organized and incorporated in the spring of 1872. There was a good deal of public spirit aroused over the matter. Other rival cities were putting in lines and St. Paul must have one. The original incorporators were Warren H. Dean, Horace Thompson, John Wann, H. L. Carver, W. S. Wright, J. W. Bass, Girard Hewitt, J. C. Burbank, William Dawson, W. R. Marshall, and Lafayette Shaw. The majority of these names are well known in St. Paul to-day, as among those of St. Paul's solid citizens. Their stock was split up among a large number of other citizens. H. L. Carver was the secretory of the company, and work was begun at once, and the cars started in August. Shortly afterward Gov. Marshall and W. H. Dean bought up all the stock, and operated the road until 1874, when Gov. Marshall bought out Mr. Dean's interest, and became sole proprietor. In August he leased it to Shaw & McComb. McComb soon dropped out, and Shaw operated it alone until 1877. In 1874 a second line had been built from Wabasha and Fourth, up Wabasha to College avenue, and along College to Rice street, reaching the then famous Park Place hotel. About this time, too, mortgage bonds to the amount of $55,000 were issued, it being claimed that $110,000 had been put into the road. In April, 1877, interest on these bonds were defaulted. The road was taken possession of by Thomas Cochran jr., as trustee under the mortgage, the holders being all eastern parties, and foreclosure proceedings were begun. Mr. Cochran operated the lines until the completion of the proceedings placed the title in the bondholders, which was in October, 1878. It was during this period that the fare was raised to six cents, and it will be remembered what a commotion this raised. Instead of increasing the reuenues it decreased them. It was not the value of the extra penny that caused the trouble, but copper coins did not circulate then to any extent, and very few people had the change. Those who did not, did not care to be compelled to take four pennies in change. The bondholders did not want the road. They offered it for sale here at a song, almost hawked it through the streets, but not a St. Paul man could be persuaded to touch it. The bondholders organized a company with A. H. Potter as president, W. H. Phillips, vice-president, and W. G. Dommick, secretary. The name was changed to St. Paul City railway, and J. R. Walsh was appointed treasurer and general manager. Mr. Walsh at once took entire charge of the road, but found very little except "two streaks of rust and the right of way." He succeeded, however, in putting it on a paying basis for the first time in its whole history. In 1879 an extension was made from College avenue and Rice street up Summit and Nelson to Western, and on Western to the corner of Ashland avenue with the aid of a citizens' bonus of $2,000. In 1880 the lines were all substantially rebuilt. They were all single tracks with switches and were now made double track. The present Mississippi street line was also built out to the bridge. New equipment was added. The site now occupied by Dickinson's store was purchased for $12,000, and, in spite of the opposition of the chamber of commerce, the central barns and offices were erected. Mr. Walsh ran the road until the spring of 1882, when the stock was above par, and the eastern owners were bought out for $165,000 by H. Greve, A. Oppenheim, F. B. Clarke, W. R. Merriam and T. Lowry, each taking a fifth. After about a year Messrs. Greve and Oppenheim purchased enough of Mr. Clarke's share to give them a controlling interest. In 1884 Mr. Lowry purchased all of Mr. Merriam's interest and the balance of Mr. Clarke's, with enough of Messrs. Greves and Oppenheim's to give him the control, which he has since held, though some eastern capitalists have secured small holdings.

The charter of 1872 gave the company rights on all streets of the city (present or future) and its bridges, with the exceptions that Third street from Wabasha to Sibley and upper Summit avenue were barred. They were also originally forbidden to put a double track on a street sixty feet or less in width. This in a good many cases in the early days compelled the company to build tracks on separate streets. The present company has, however, succeeded in having this sixty feet restriction done away with.

St. Paul — The Thomson-Houston Electric & Power Co. have petitioned the council for a franchise to construct electric street railways here.

Stillwater—The Stillwater Street Railway company has floated mortgage bonds to the extent of $60,000, and, in a trust deed filed by the company with the secretary of state, Allen Curtis, of Boston, Mass., is named as the trustee.

Winona—The proposed ordinance which has been pending for some time granting to the Winona City Railway company the franchise to put in an electric plant, operate its lines by electricity and furnish electricity for lighting and power, recently came up for consideration before the city council:

It appears that some weeks ago a number of St. Paul gentlemen bought up a large amount of stock of the Winona City Railway company from Winona business men. These St. Paul gentlemen, in company with B. H. Langley, a large local stockholder, found themselves at the annual meeting of the street railway company in control of a majority of the shares of stock, enabling them to elect directors and officers. The directors publicly avowed the desire to introduce electricity into the street car system and to put in a power plant here, involving an investment of $50,000 to $100,000. For some weeks the ordinance has been pending before the council and it appeared, from the lively tilt, that there was a minority faction of the street railway company strenuously opposed to the council's granting the franchise asked for.

The right to adopt electricity was rejected by the council.

MISSOURI.

Kansas City, Mo—All the injunctions against the Kansas City Cable Railway company have been been dissolved by Judge Field on the condition that the company pays the Washington street property owners the damages allowed by the commissioners in their recent report. The attorneys for the company accepted the conditions and the work may now go on.

City Counselor Slavens recently delivered an opinion in regard to the license to be paid on street cars. The opinion is in substance that according to the revised city ordinances the street railway companies must pay a license of $25 a year for every car used at any time during the year.

In 1882 he says an ordinance was passed that each car used in the city should be taxed such a sum as a license. In the years 1886 and 1887, when a number of cable franchises were granted, a clause was embodied in the franchise which virtually repealed the car license ordinance passed in 1882. It was to the effect that license should be paid according to the average number of cars used per day. While this clause acted as a repealing measure on the ordinance of 1882, which, by the way, was aimed at the horse street

When it is considered that well made concrete will stand a tensile strain of 15 tons to the square foot and a compressible strain of 200 tons to the square foot the uselessness of yokes is apparent.

The bearings for the carrying pulleys are also anchored in the concrete and set on either side of the tube leaving a clear waterway of three or four inches its entire length, which can be drained into sewers where depressions occur.

The slot irons are fastened to the sleepers by a three-cornered piece of iron called a gussett or by two pieces of 2 x 2 angle set back to back with a half or three-eighths in. bar running back six or eight inches to the sleeper, giving ample strength. The work is done more rapidly than if yokes were used as their accurate adjustment requires much time. The moulding of the tube also requires less time as the moulds are made long enough to reach from man-hole to man-hole and are pulled up through the slot.

The ramming of the concrete is done more expeditiously than with yokes as the iron work is not encountered in the greatest part of the work.

The estimated saving in cost of construction over the present Omnibus cable road construction in this city is $10,500 per mile and on another road constructed a few years since the saving is $42,000 per mile double track.

We therefore claim a maximum amount of strength and durability with the least possible cost for a permanent structure.

San Francisco. Yours truly,

E. H. Marwedel.

Asphalt: Criticism on a Critic.

A Review of "Asphalt, its Uses and Values," as claimed by Veritas, in the August number of the "Western Architect and Building News," Denver.

In his well-written article, advocating the use of the Asphaltum combinations for city pavements, the writer seems to be carried away with what he saw in the California cities, forgetting that those cities and towns when compared with the great central and eastern cities are fitting illustrations of the saying that "God made the country and man made the town," or, following the deductions therefrom, and confining ourselves to the subject under discussion, we may say that "God made our granites and quartzites while man has tried to make an imitation strong and compact enough to serve as a substitute." In this we still claim that he has absolutely failed, not on account of a lack of knowledge of geology and chemistry, nor because he hasn't almost discovered the lost art of the alchemist; but, because of time—when Nature has produced the glittering gems or the solid, massive mountains of granite and quartzites.

She has required countless ages to perfect the combinations known to us by the generic name of stone. Admit for the nonce, that man is equal to Nature in his skill and research, still the time during which it is possible for him to use in the production of anything in the art imitative is entirely too brief, hence failure is certain. If we expect his success as shown at the Pyramids and other inert masses, which, from the climate or from their uses, are free from contact with aught that will cause disintegration, we submit that the Pyramids are not serving stone purposes.

No artificial combination has ever yet been made that could be successfully subjected to the rasping abrasions and wear of the traffic wheels of commerce. In this city of Chicago on some half dozen streets, with not more than a fair average of traffic, thousands of dollars have been expended on asphaltum, and that before the five years guarantee limit has been passed.

Compare these results with the fact that the great quartzites of the Big Sioux River, or the equally famous stone from Berlin or Green Lake, Wis., with proper foundations "and work honestly laid," should last seventy-five years, and then the material may be reversed and serve another generation.

"Veritas" seem to have, in the capacity of an asphaltum colporteur, gathered many favorable opinions for his noiseless material. We quote "noiseless" with a full understanding that that is the only virtue that the material possesses, because it has neither long life nor successful service to recommend it.

Nothing but stone will serve the purposes of stone on the streets of any large city. Objections to the noise are well taken; but this results measurably from the faulty forms of the pavement, like most errors from the art imitative. To illustrate, a heavy lateral crown is entirely useless, the drainage sought for should be longitudinal, forming what is called "drainage waves," then the whole surface of the pavement is at your service, it is flatter, it is less noisy and it is longer lived.

It is not necessary for us to enter into any argument to show how far the best efforts of engineers are neutralized by the want of common honesty on the part of contractors and inspectors, a factor which has always materially assisted in bringing public works into disrepute, especially those of a faulty nature.

CORRESPONDENCE.

Minneapolis, Minn., Aug. 30.—The street railway interests of the Twin cities are just now in a frightful tangle, which is, however, portentious of big investments and rapid transit in the immediate future. Tom Lowry, president of the Minneapolis and St. Paul street railway companies, after considerable trouble, by one vote in the city council, knocked out the Anderson and Douglas (Philadelphia syndicate) opposition so far as Minneapolis was concerned, but it was only done at the expense of entering into bonds to build and operate before Oct. 1 next, four trunk cable lines, and to experiment with electricity as a motive power with a view to its adoption on all other lines. Then the fight was transferred to St. Paul, where the franchise is more iron-clad, and where the opposition was stronger. There were six applications for street railway franchises before the last meeting of the St. Paul council, and four were granted practically without opposition. The franchises granted were: First, The Dawson-Lindeke ordinance, giving Wm. Dawson, Wm. Lindeke, A. H. Wilder, F. L. Schurmeir and E. G. Rogers the right to occupy such streets with electric lines as the council may hereafter designate by a three fourth vote. Second, the Joseph Lockey and C. A. Moore syndicate, the right to operate an electric line on Wabasha and Sixth streets, Smith Avenue, Forbes, Douglas and Lisbon streets to the Fort Snelling bridge. Third, a general franchise for routes not named to the Thomson-Houston company, provided five miles of track be laid within one year, fifteen miles within two years and thirty miles within three years. Fourth, an ordinance granting the St. Paul street railway company the right to extend its Selby Avenue cable line two and one-half miles out Selby Avenue to Fairview Avenue, Merriam Park. For the latter line the citizens of St. Paul willingly pledged a $100,000 cash and property bonus, believing that it will rapidly develop the inter urban district, and add $3,000,000 to the assessed valuation. The city railway's ordinance to operate electric lines, the Acme Electric company's ordinance and the Allen-Swiney ordinance were rejected.

The St. Paul City Street Car company have an ordinance that gives them the exclusive right to operate horse cars on all except two streets in the city, and in order to head off the rival companies have for a week been laying track on all desirable unoccupied streets. The track is buried so as not to be declared an obstruction, and it serves the purpose of holding the street against the opposition. As soon as the Lockey-Moore ordinance was passed, president Lowry put a gang of one hundred men at work laying track on Sixth and St. Peter streets, a part of the route named in the opposition ordinance. This so incensed public opinion that the city attorney was instructed to take steps to secure an injunction, and the rights of the St. Paul company are immediately to be tested in the courts.

Work will commence at once upon the Selby Avenue cable extension, and the opposition companies have plenty of capital and signify their intention of making use of their granted rights at once. It is the plan of the Thomson-Houston company to apply to the Minneapolis city council for the right to reach the heart of the city by electric lines across the Washington, Franklin and Cedar Avenue bridges, thence by trunk line up First and High street to the Union depot. These streets are without the fire limits, and no objection could be made to overhead wires. If this privilege is granted by Minneapolis, and there is nothing but the opposition of Mr. Lowry to interfere, the Thomson-Houston company will connect their Minneapolis and St. Paul systems, thus solving the problem of quick and cheap transit between the city of Minneapolis with 230,000 people and St. Paul with 200,000 people. The fare will not exceed 25 cents for the round trip (one-half the monopoly charges), and it is believed the trip can be made in 18 minutes. The Thomson-Houston company agree to equip with the most modern of cars, make the fare five cents within the city limits, and agrees to give bonds for $50,000 to save the city harmless from all damages, costs and expenses, and engages to have the lines in operation one year after the passage of the ordinance. The franchise asked for is to last 30 years. The wires and poles are to be erected subject to the direction of the city engineer and approval of the city council. The company agree to pay a tax of $25 per year on each car to the city. The ordinance gives the company 60 days in which to accept the terms of the city. This ordinance will be worth millions of dollars if Minneapolis grants the same concessions already granted in St. Paul.

Minneapolis is to have in operation before snow flies the largest manufactory of street cars and omnibuses in the United States, with a capacity of 4 cars a day. The firm which is back of the enterprise is Robinson & Moan, of Chicago, Ill. The main building is to be 220 feet long by 60 wide, with an ell 80 feet long by 60 wide, and two stories high. Mr. W. S. Robinson, the head of the firm, has closed a deal with the H. C. Akeley Lumber company for 300,000 feet of lumber, and the contract has already been signed. The site of the street car works consists of about five acres of land at Parker's station, on the Manitoba road, at Crystal Lake, and the plant which will ultimately be put in will employ in the neighborhood of 1,000 skilled mechanics. The firm will still retain an office in Chicago. The main building will probably be completed by the middle of October, and sooner if possible. A foundry will be built in the spring, or possibly this fall, and all of the modern conveniences in the shape of dry kilns, engine and boiler houses and blacksmith shops will be put in this fall.

For the Minneapolis system of cable lines four power houses will be required. The house located at the Thirty-first street junction will be used to operate the First avenue south cable line, and the other adjacent to the general offices of the company on Third avenue north, will be utilized for operating the Washington avenue line, and the loop. These lines are to be completed and in operation by July 1, 1890. Mr. Lowry has let the contract for 8,000,000 pounds of yokes and castings for these lines to Mysenburg & Co., of Chicago, agents for the Blakeney foundry, of Springfield, O. The price is given out as $28 a ton, the lowest of a number of bids. Contracts remain to be let for the furnishing of slot and girder rails, power house engines and materials necessary for the construction of the two power houses.

Two more power houses will be located soon, and be finished in time to operate the Hennepin and Bloomington Avenue cable lines, to be in operation by Nov. 1, 1890. George Poole, of Baltimore, the representative of the Robert Poole Manufacturing company of that city, is a prominent bidder for the motive power machinery necessary for the actual operation of the cable. The machinery includes the enormous compensating carriages, the entire four to be modelled after the one in use at the Selby Avenue power house in St. Paul.

The bids for the machinery have not been opened yet, but the work will be awarded to the most responsible party, all other things being equal.

The bids now being received concern only the Washington and First Avenue south lines, which will be completed before work on the other lines commences. I. C. U.

Exhibitors will do well to have their goods ready for inspection in Minneapolis before the 16th of October.

sensible man he invests in corner lots in far off Boomville. Suddenly this old capitalist is shocked by the news that a syndicate of Chicago capitalists have actually bought up the road and all thereto pertaining; have contracted for the installation of an electric system of rapid transit; have increased the capital stock, bonded the road and sold the bonds; all before he recovered from his surprise at his own stupidity in allowing such a golden opportunity to slip from his grasp for the investment of his entire capital at his own hearthstone. George H. Bliss, of Chicago, recently visited a western town and endeavored to persuade local capital to take hold of a railway line, and finally had to secure outside capital. Now that it is too late, all the local capital is at his command, and parties from neighboring towns are ready to aid Mr. Bliss in every way. "What fools these mortals be," is an appropriate quotation.

Another Strike Failure.

An attempt to organize a strike on the lines of the Atlantic Avenue Railroad company of Brooklyn, was made on the morning of Tuesday, November 19, 1889. The movement was disconnected and without plan, and as a result proved very short-lived. The first car, which should have gone out at 4:30 A. M., was delayed until nearly seven o'clock. Cars were thereafter run out on the respective lines as promptly as sufficient police were afforded to properly protect the property of the company, and those in charge of it; and by the early afternoon the ten lines of the company were in regular schedule operation. It is hard to understand what was the apparent cause of the outbreak; but it seems to have been formulated by about fifty of the drivers and conductors of the company, some of whom had been conspicuous in previous troubles, who met at one o'clock the morning of the strike, and under the influence of a proper amount of "enthusiasm" voted to tie up the road. There were no disturbances of a serious nature, and the only persons who were in any way annoyed by the trouble were those who had to walk in the drizzling rain of the morning.

Correspondence.

FROM MINNEAPOLIS.

There has been a wonderful change in the status of street car affairs in the Twin Cities within a month. After President Lowry had overcome the opposition of Messrs. Anderson & Douglas in Minneapolis, by giving bonds to build three trunk cable lines and electric lines, he was confronted with still stronger opposition in St. Paul. Franchises were granted to three or four local opposing companies and President Lowry was forced to commence proceedings in the courts to defend his rights and protect his franchise, which he held to be exclusive. The result will be that St. Paul will get about thirty-two miles of cable and electric roads, to be built this fall and next year. The more important provisions of the grant in St. Paul are as follows:

All lines and extensions, comprising thirty-two miles, to be completed on or about Nov. 1 of next year, and all within two years, when a system of transfer checks shall go into vogue. The company may operate by cable, electric, pneumatic or gas power, but prohibits steam, etc. The conditions of the ordinance so far as practicable, apply to the cable lines. The council may regulate the speed of running cars, so far as to conform to the speed generally permitted for similar cars in other cities. The company shall keep the streets unobstructed by snow within 24 hours of a snowfall. The streets exempted from street railway use are: Dayton avenue, Nelson avenue, Western avenue from Nelson to Summit avenue, Sixth street, Minnesota street, Cedar street, Sibley street Eighth street, Central avenue from Robert to Wabasha street, Sherburn avenue from Robert street to Park avenue, Summit avenue and East Summit avenue from Rice to Robert streets, and Aurora avenue from Robert to Wabasha streets, Forbes avenue from Exchange to Douglass street.

The company is to pay $10 license on each car annually, and also 3 per cent of the gross earnings of the company as a tax, except during years when the 3 per cent of the gross earnings do not exceed the general and ordinary tax The company is to file a verified statement of its earnings with the city treasurer each year. If the company fails or neglects to complete, equip and operate all its lines designated in the ordinance by the time specified, the company forfeits its franchise. The company is also required to file a bond in the sum of $100,000 to perform the provisions of the grant, and the grant has a life of 50 years. The ordinance grants electric privileges on all the existing horse car lines in addition to the proposed new lines, which are as follows:

First—On Como avenue to Front street at its junction with Dale, to be completed by Nov. 1, 1890. This line will be extended to Como Park when the streets are sewered or the lake in the park restored, but not sooner than Jan. 1, 1891. Thence from the park the line will be carried to St. Anthony Park during the year 1891, provided the streets are all sewered prior to Jan. 1, 1891.

Second—On Maria avenue, from Seventh to Plum; Plum to Hastings avenue and thence to Earl street, to be built in 1890. In 1891 the line will be carried to Indian Mound Park.

Third—On Fifth street, beginning at the corner of Wacouta, to Broadway, to Mississippi, to York, to Westminster, to Case, to Arkwright, to Maryland street, all to be built in 1890.

Fourth—Jackson street line to be extended via Jackson and Fairview streets across the railroad tracks to Cortland, and on Cortland to Maryland avenue to be completed before September, 1891. Cortland street has not been graded, and that work will be done next year.

Fifth—The University avenue line to be extended to the west city limits in 1890. This is to be a through rapid transit line between St. Paul and Minneapolis and is to be completed in three months.

Sixth—On West Seventh street to Fort Snelling bridge. This extension is to be built under an arrangement with the property owners along the route, whereby they will pay the operating expenses of the line during a term of five years and in return take the gross earnings.

Seventh—Three lines in West St. Paul, all to be built in 1890. First, an extension of the Concord street line to the Concord street railway station; second, a line from the corner of Concord and State streets to South Robert, to Annapolis street; third, an extension of the Winifred street line on Ohio to George street, to Smith avenue, to Annapolis street.

Eighth—On Winifred street in West St. Paul, from Stryker avenue to Annapolis street, to be built in 1891. Preparatory to the construction of this line, much heavy grading will have to be done next year.

In addition to building all these lines, Mr. Lowry will also build the Cochran Ireland electric lines, one on Grand avenue to the Mississippi river, the other from the junction of Randolph and Seventh streets to the Mississippi. In all, therefore, there will be four rapid transit lines across the city to the Mississippi.

Mr. Lowry has already filed his bonds and has gone to work in earnest in both cities. In Minneapolis the poles are set on the Fourth avenue line and the Thomson Houston company has entered into a contract to equip the line for electricity by Nov. 1. This and the Grand Avenue line also being built in St. Paul are looked upon as experimental. It is proposed to give them a thorough test during the cold and snow of a Minnesota winter, and if successful,electricity will probably supercede horses on all lines other than cable power next summer.

In order to provide funds for the extensive improvements under way Mr. Lowry has filed two mortgage bonds in favor of the Farmers' Loan and Trust company, of New York City, for an aggregate sum of $1,620,000. The bonds cover the property of the Minneapolis Street Railway company and the Minneapolis, Lyndale & Minnetonka railway.

This amount covers the $1,000,000 mortgage of the street railway company, of which $400,000 in corporate bonds bears date of Nov. 1, 1880, maturing in 30 years, with privilege of paying $10,000 a year from 1890 to 1897, both inclusive, and $20,000 a year thereafter until and including the year 1909, and bear interest at 7 per cent. payable semi-annually. Six hundred thousand dollars' worth of the bonds date Nov 1, 1883, and mature in 30 years, at 6 per cent., payable semi-annually. The mortgage of the Minneapolis, Lyndale & Minnetonka railway is for $620,000, the bonds bearing date of April 1, 1887, and also maturing in thirty years, but the rate of interest is 5 per cent. per annum, payable semi annually. The deed records that these bonds are issued for improvements now in progress and for which the roads have contracted an unsecured indebtedness—the street railway for $400,000 and the Lyndale for $180,000. The bonds are to be issued in $1,000 denomination, not exceeding 10,000 in any one issue, dated Jan. 15, 1889, and bearing interest at 6 per cent. per annum. Among other things the recorded instrument covers the amount of money to be used in making the improvements, that for single track horse street railway not to exceed $10,000 par value per mile, not including side tracks and turnouts, and that for cable lines $60,000 per mile, par value.

The question of rapid and cheap transit between Minneapolis and St. Paul has also been settled. Franchises have been secured for an electric line from First Avenue south, Minneapolis down Third street to 15th avenue south, thence to Washington avenue, across the Washington avenue bridge, down Cambridge street to University avenue, and from University avenue direct to the heart of St. Paul via the present University avenue line. The distance will be about nine miles and the fare ten cents each way with transfers in either city. The company is to pay a tax of $25 per year per car on the average number of cars operated on said line. The tax is to be paid on the first Monday in January, and is to be for the preceding year. The present fare by the short line trains between the two cities is 30 or 50 cents for the round trip.

The electric cars will make the trip in 18 minutes and will break the monopoly in rates that has been worth millions to the regular railroads. It will also help to build up the interurban district and make the two cities one. A power house is to be established at a point equi-distant between the two cities, and the contract will be given to the Thomson-Houston company. Beside the Washington, First avenue and Bloomington avenue cable lines that the Minneapolis Street Railway company built by resolution of the city council, the company has petitioned for the privilege of running a cable line from the corner of Washington and Cedar avenues to Riverside, thence to Twenty sixth avenue south, thence to Twenty-fifth or Twenty-sixth street. This was granted, as was also the privilege of building a "loop" on First avenue south, from Washington avenue to High street, thence to Hennepin avenue and thence to Washington avenue.

Six car loads of yokes and other material have already arrived, and it is the intention to put in the curves and loop this fall, leaving the main lines until spring. At the sites for the power houses all the men who can be crowded on are working day and night on the excavating. It is proposed to get the power houses enclosed before winter, and to put the ponderous engines and driving machinery in position during the cold weather.

Five hundred men are at work laying temporary tracks on Third Street north, for about two miles. These will be used in the spring, while the Washington avenue cable line is being built. Contracts have been closed for slot and girder rails for the cable lines, aggregating in weight about three thousand tons, with Johnson Company of Johnstown, Pa. The C. H. Ruddock Company of Minneapolis secured the contract for the 600,000 feet of oak lumber for the construction of the First avenue south and Washington conduits. George Poole, of Baltimore, the representative of Robert Poole & Son (Limited) Company, was a successful bidder for the machinery necessary for the actual operation of the cable. Bids for the cable lines other than those of First avenue south and Washington will not be advertised for for some time yet.

The council of North St. Paul has granted a franchise to Stone & Morton, of St. Paul, to use the streets of the village for railway purposes. They will build a line to be operated by steam or gas power, to connect with the West 7th street St. Paul cable line at its terminus. The distance of 12 miles will be made in 38 minutes for a ten cent fare.

The large cable has arrived for the Incline road at Duluth.

Bids for constructing a street car line from Broadway to the State institution for the deaf and dumb, at Omaha, have been solicited.

The contracts for the yokes and castings for the Selby avenue, St. Paul, cable line extension have been let by Col. Barr to the St. Paul foundry.

The answer of the Winona, Minn., City Railway company has been filed in the injunction proceedings brought by the minority stockholders to prevent the introduction of the proposed electric plant. The answer avers that the election held in June last was in all respects fair and legal, and that the proposed improvement is for the more efficient operation of the road.

James Clements, the Bay City, Mich., street car magnate says that his company will propel cars by electricity as soon as the change can be made.

Eighty teams are at work grading for the street car extension at Pierre, the temporary capital of South Dakota. All arrangements have been made to put in a motor power next spring, to be run by storage batteries.

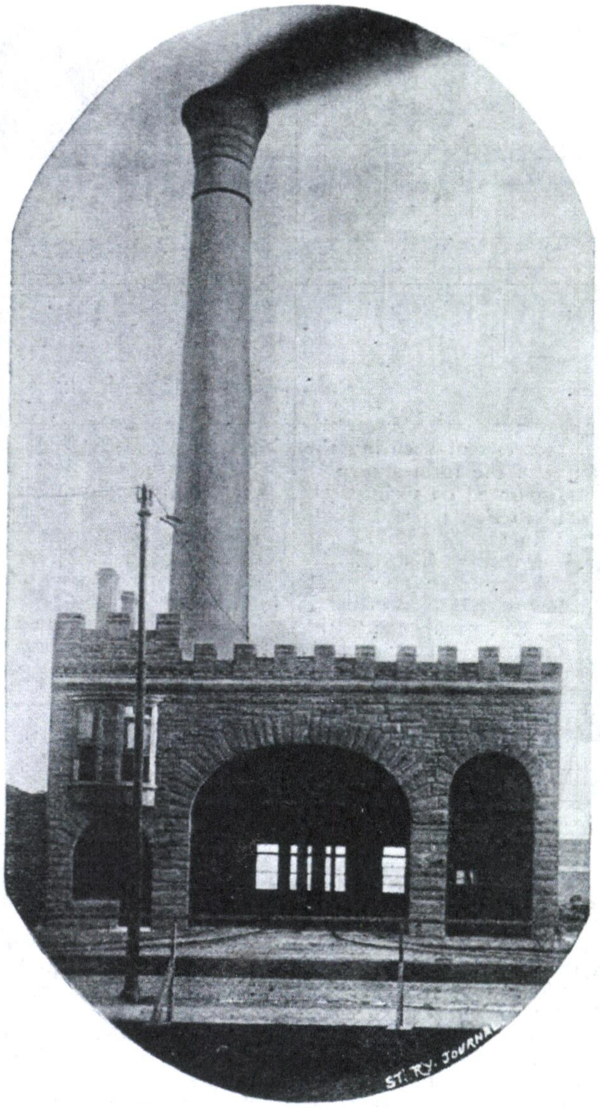
The petition of the Omaha Street Railway ward, withdrawing the cogged wheel thereon from engagement with the other cogged wheel, and the rotary movement of the brushes ceases. At the same time the brushes are raised from the rails by means of the long levers shown in the view, and are movably connected to the brush shafts, about midway between the outer end of the brush and the universal joint. The brush shaft hanger has vertical adjustable bearings in which the brush shaft revolves, so that the brush can be raised from the track.

While this is arranged for using the car axle as a motive power, any form of motor can be used if preferred.

The inventor is Mr. John Seror of Cohoes, N. Y.

Electric Railway at Duluth, Minn.

We present two views this month showing the power house and dynamo room of the Duluth Street Railway, Duluth, Minn. This road is about fifteen miles long, the greater part of which is double track. The work of changing from mules to electricity was commenced last Summer, the Thomson-Houston system being adopted. Originally the track was 3 ft. 6 gauge, but it has been changed to standard gauge, 4 ft. 8½. The old rail has been replaced by a girder rail set on chairs which are placed on ties three feet between centres, the ties being set on crushed rock and cement. This makes a very rigid roadbed for the operation of electric cars.



POWER HOUSE, DULUTH STREET RAILWAY.

The city of Duluth, as is well known, is situated at the extreme west end of Lake Superior, on a hillside. The main line of the railway on Superior Street runs parallel with the hill, and a branch line on West Third Street runs up the hill on a grade of over eight per cent. for about four blocks. The electrical equipment decided upon for this service consists of twenty-eight 15 H. P. motors and ten 20 H. P. motors of the Thomson-Houston make. Twenty-four of these motors are mounted on twelve Hubbard trucks made by the McGuire Manufacturing Co., of Chicago, and an order has just been placed for the remainder of the motors to be mounted on seven Bemis trucks. The nineteen 16-ft. car bodies are supplied by the Laclede Car Co., of St. Louis, Mo.

The power station is situated about the centre of the system, and, as will be seen from the illustration, is a very fine building for the purpose. It is erected on the side of a hill and built of brick with brown stone trimmings The engine room is on the second floor, below the street level, so that the windows do not show in the view of the exterior. The dynamo room is on the first floor and is very well illustrated in the interior view.

The steam equipment consists of one 375 H. P. Reynolds-Corliss compound condensing engine, which has been erected by the E. P. Allis Co. of Milwaukee. Three pairs of boilers are used of the Babcock & Wilcox type. In the dynamo room are placed five 80 H. P. Thomson-Houston generators, which are to supply the current for nineteen cars. Ample room is left in the station for doubling the plant, which in a growing city like Duluth, will soon be necessary. On the street floor of the power station, space is left to provide for a large number of cars, which will probably be added in a short time. The offices of the company are also on this floor, and for convenience of arrangement leave nothing to be desired. The car barn is at the east end of the line and is of the same general design as the power house, and in matters of convenience for cleaning, storing and repairing cars is excellent. The cross suspension overhead system is used, and the wires are supported from neat iron poles placed on either side of the street. Throughout the whole system, the results obtained show that the street railway company have adopted the wise course of allowing for a large increase in their business, and also that street railway buildings can be made so attractive as not to decrease the value of adjoining property. Twelve of the cars were put in operation November 21 and have been fully appreciated by the public.

The Minneapolis Street Railway Co.

The Minneapolis street railway has been a very important factor in the progress and prosperity of this city. The magnitude of its operations and its interests are especially to be remarked at the present time, when, during eight months past, it has rebuilt eighty miles of track in changing the system from that of animal locomotion to electric power. During that time there has been expended over $1,500,000, a large part of which has gone to the working people of Minneapolis. It is thought that the great development of the street railway system, with its extension of rapid transportation to all parts of the city and its suburbs, will have a most important effect on the real estate and general interests of Minneapolis, making a decided epoch in its solid and substantial growth in wealth and population.

The street railway franchise is regarded by many as a "big bonanza." It is an excellent property, but its value has been overestimated and overstated. While some of the better patronized lines may be quite profitable, the more remote lines may be running considerably behind. It certainly cannot be said of our street railway management that it has waited to establish new lines until such lines would pay. It has always complied cheerfully with the requests of the common council and co-operated with the wishes of citizens, running lines into sparsely settled districts far ahead of any possible prospects of remuneration for the expense involved, not only for months, but for years.

When street railway lines were first talked of in Min-

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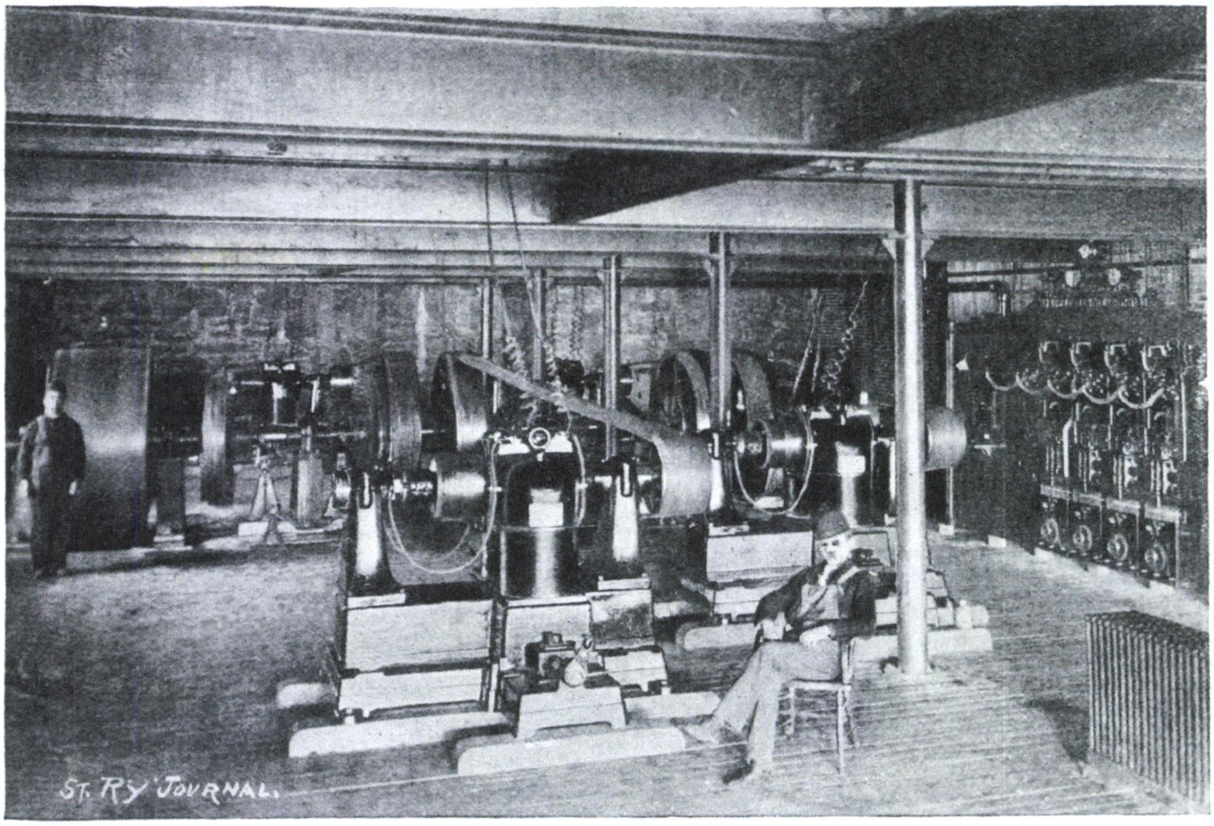
neapolis, during the early '70s, there was no one ready to take the risks of such a venture. When the charter was granted in 1875, with a fifty-year franchise, it was predicted and generally believed that no man then of middle age would live to see the time when there would be "any money in it." The franchise and the stock went begging, almost literally.

In the mean time, however, Thomas Lowry had come to Minneapolis from Illinois and begun the practice of law. Mr. Lowry was not exactly a capitalist at that time. He was a hopeful young man with a good humor and an enthusiasm which were irrepressible and irresistible. It is stated that he and a physician, whose practice now brings him in $20,000 a year, hired a room at four dollars a month and carried up their own wood and water. In these exercises they took turns.

Mr. Lowry had built up quite a good law practice, and had, by dealing in real estate, secured some capital, when his attention was directed to the struggling street railway company, which, to use the words of one of our leading citizens, "never amounted to anything until Tom Lowry took hold of it and threw into it all his energy and a good lot of money and hard work." Mr. Lowry traded real estate for most of the stock and took charge of affairs in 1878. In 1880 about twenty-five miles of track had been built. A line ran from 4th Avenue N on Washington to Cedar Avenue, another by 4th Street SE to the University; one on 4th Avenue S to 15th Street; and one up Hennepin Avenue to 12th Street and across on 12th to Portland Avenue. The system has in ten years been developed and extended so as to now comprise 120 miles of track in all parts of the city, and extending to many distant suburbs.

During this season some eighty miles of road have been entirely rebuilt. By the 4th of July, 1891, the company hopes to be able to celebrate its great industrial achievement of changing the entire bed, tracks and equipment of all its lines from adaptation to horse power traction to the latest and best electrical power appliances known either in this country or in Europe. Both the Sprague and the Thomson-Houston electric systems are here in use. Centre poles are used to support trolley wires overhead, which carry the electrical current, as in other cities, but besides, there are laid many miles of conduits for feed wires to augment the electric force in the wires overhead, as desired. In other cities no conduits are used, and in this and other respects our street railway system is superior, being, in fact, the best in use, with the latest and best devices of all kinds known to electrical science at its present stage of progress.

The present equipment of cars is 450, with 120 motors, costing each from $3,500 to $4,000. With the system completed, 200 or more will be needed. Several large power houses have been built, where are located 3,000 H. P. engines and twelve dynamos of 200 H. P. each. Employment has been given this year to some 1,500 men, nearly all being employed who made application, at fair wages.



DYNAMO ROOM, DULUTH STREET RAILWAY.

The officers of this company are: Thomas Lowry, president; C. D. Goodrich, vice-president and general manager; E. H. Center, secretary; M. B. Koon, treasurer, and D. W. Sharpe, superintendent. Mr. Goodrich has sole charge of operating and constructing this great street railway system, and its excellence is due very largely to Mr. Goodrich's ability. Joined with him is an excellent office and operating force, all united in securing the best results.

Mr. Lowry is a prominent shareholder and director in the "Soo" and in the Minneapolis & Pacific railways, and has served as their president. He is a genial, generous gentleman who aids every benevolent enterprise and does his full share and more to promote the general welfare of the community. Minneapolis has just cause to be proud of Thomas Lowry, and is certainly highly favored in so excellent a system of street railways as have been developed under his control.—*From the Minneapolis (Minn.) Journal.*

* * *

"Why, how did you cure that game leg? I thought you would be lame for life." "So did I before I got a verdict for $5,000 against the railway company, but that straightened it out in no time."—*The Epoch.*

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St. Paul—Minneapolis Electric Street Railway System.

The twin cities of the Northwest, Minneapolis and St. Paul, possess a system of street railways which ranks amongst the largest in this country. Although the roads in the two cities were originally built, and have been until recently operated as separate and distinct systems, it is most interesting to note the similarity in the main points of construction in the two systems.

At the present time the corporation which controls all the lines in the two cities is officered as follows: Thomas Lowry, president; C. G. Goodrich, vice-president and general manager Minneapolis Street Railway, and A. L. Scott general manager St. Paul City Railway.

With slight exceptions the centre pole construction is in use throughout, iron poles being employed in the business streets and interurban line, and octagonal wooden poles in the suburban and outlying districts. All current is supplied by Edison generators, and Edison motors are largely used, though not exclusively, the Thomson-Houston being represented to a considerable extent. In all, nearly 225 miles of double track is in daily operation, of which 125 is in the corporate limits of Minneapolis and 100 in St. Paul.

In the road construction, girder and T rails, made by the Johnson Co., are being used. The weight of rails varies somewhat, being influenced by the traffic, but all lie within the limits of sixty pounds for the minimum and 100 lbs for the maximum.

The number of cars in daily operation, of course, changes according to the exigencies of the traffic, but a fair average may be taken as about 130 cars in St. Paul, and about 250 in Minneapolis. These cars are from the shops of various makers, Jones, Laclede Car Co. and Northern Car Co. being largely represented. Bemis trucks are used throughout the system. All the closed cars are of one standard length, eighteen feet seven inches, and, in Minneapolis, are all painted canary yellow with white trimmings, the different lines being distinguished by signs on the roofs. In St. Paul the various lines are designated in the same manner, the prevailing color in this instance being a rich green.

The power stations of the consolidated lines are models of convenience and engineering skill.

The St. Paul plant is equipped as follows: The boiler plant consists of six 270 H. P. Babcock & Wilcox boilers fitted with crude oil burners. As auxiliary to these and part of the steam plant are the necessary circulating pumps for oil and water, which are of various makes and types. In the engine room are three 900 H. P. condensing triple expansion engines made by the E. P. Allis Co., of Milwaukee. This latter firm furnished the plans for this station and the arrangement of shafting, clutches and belts, which are shown in the detailed drawing, Fig. 1, accompanying this article.

The station is most complete in every detail and embraces all the essentials of power transmission. The clutches are of the Hill company's manufacture and are

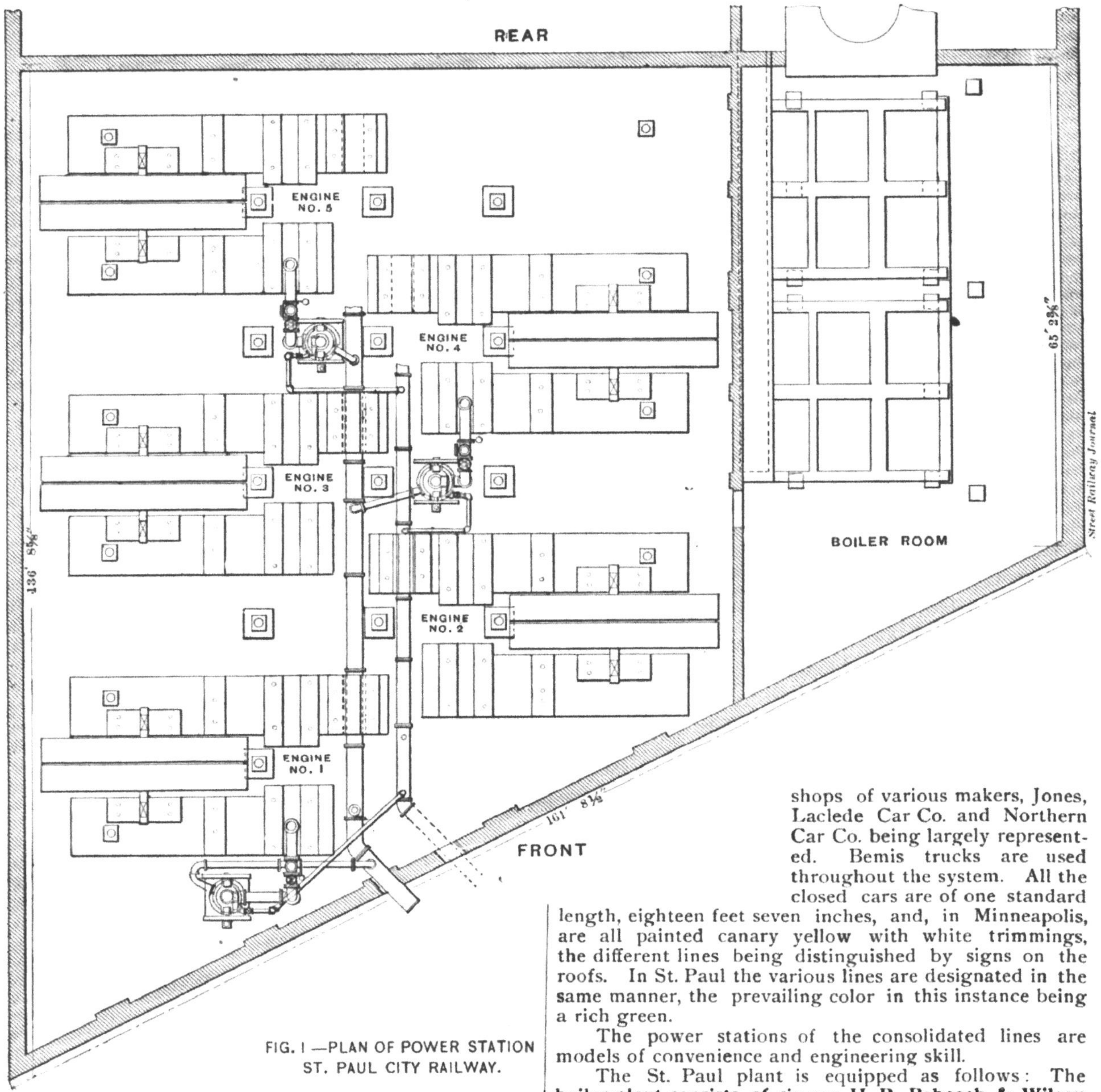

FIG. 1—PLAN OF POWER STATION ST. PAUL CITY RAILWAY.

so placed that all four generators may be run singly or in concert without unnecessary friction of shafting. The air pumps for each engine are situated in pits beneath the floor line of the engine room. The ultimate capacity of the station, when all the engines are in place, will be 45,00 H. P.

The use of oil for fuel has proved quite satisfactory and productive of excellent results as regards labor, the absence of ashes, the ability to maintain a uniform pressure and the high efficiency attained by the boilers. The method of obtaining a constant pressure of oil, devised by Engineer Larkin, is worthy of more than passing notice. As will be seen by the accompanying sketch, Fig. 5, the oil tank is located beneath the floor of the boiler room, and the pump discharges into a standpipe fitted with an overflow, so that the oil reaches the burners at a constant pressure under an eighteen feet head. The daily consumption is about 4,500 gals.

The dynamos are of the Edison 150 kilowatt type, arranged in groups of four, and are situated on the floor above the engines. The interior of the dynamo room is shown in Fig. 5. The dynamo station does not differ materially from the many erected by the Edison General Electric Co., but it is characterized by the most scrupulous cleanliness, and orderly appearance.

The Minneapolis station is arranged upon a somewhat different plan, as is shown by the accompanying drawing, Fig. 6.

The boiler plant shown in Fig. 7 is composed of five 275 H. P. Babcock & Wilcox boilers, fitted with oil burners, carrying a pressure of 135 lbs. per square inch. The circulating pumps are of various types, including the Deane, Hall and Knowles makes.

The plan of the engine room is fully set forth in the engraving. The engines are triple expansion condensing engines, made by the E. P. Allis Co. of Milwaukee, and have been worked as high as 1,500 H. P. each. The condensers are grouped and are entirely separated from the main engine room.

In the upper floors of the main station are the general offices and woodworking and paint shops. The dimensions of the station are 218 × 200 ft., three stories high. The generators are sixteen in number and are, like those at St. Paul, of the Edison 150 kilowatt type. The switchboard, shown in Fig. 9, is not complete at present, but when finished will be second to none in the country for utility and convenience.

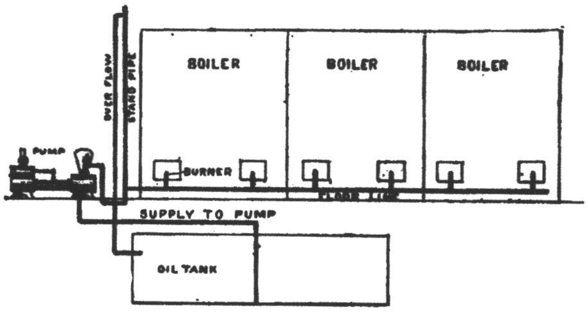

FIG. 3.—OIL PIPE CONNECTIONS ST. PAUL ELECTRIC RAILWAY STATION.

The machine shop, situated in the main power station at Second Street and Third Avenue north, is unusually large and is equipped with all the necessary machine tools for making all repairs. The company also manufacture all of the gears in use on these cars. Ample provision has been made for the repairing of both motors and trucks. In fact this department of the road has a capacity far in excess of many pretentious manufacturing concerns.

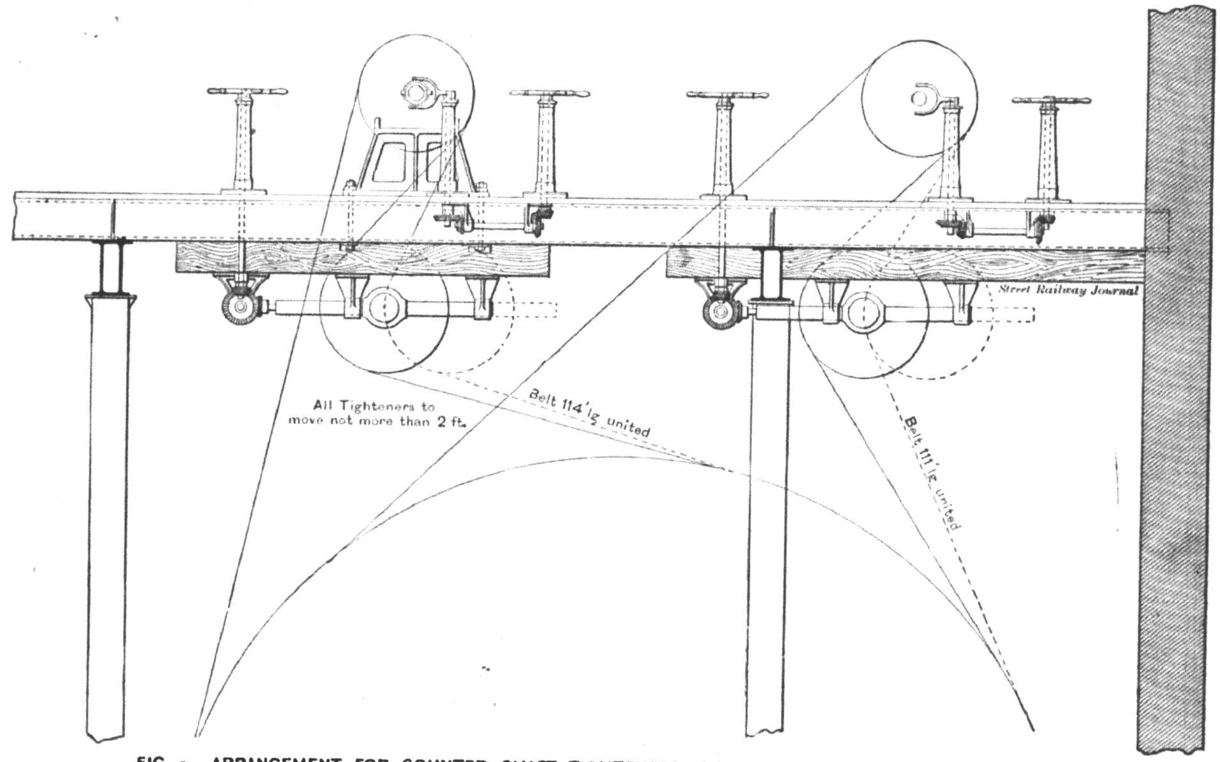

FIG. 2.—ARRANGEMENT FOR COUNTER-SHAFT TIGHTENERS—ST. PAUL ELECTRIC RAILWAY STATION.

To illustrate this point, two sprinkling cars, one of which is shown in Fig. 10, have recently been completed in the shops. These cars are an innovation and will, no doubt, be extensively adopted by many of the larger roads throughout the country. The tank is made of boiler iron and has a capacity of ninety barrels. This is mounted upon a flat car and is provided with a swinging arm which projects beyond the track and sprinkles the roadway. In addition to this, provision has been made

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for sprinkling the track proper. It is proposed to draw this car at a good speed by a motor car.

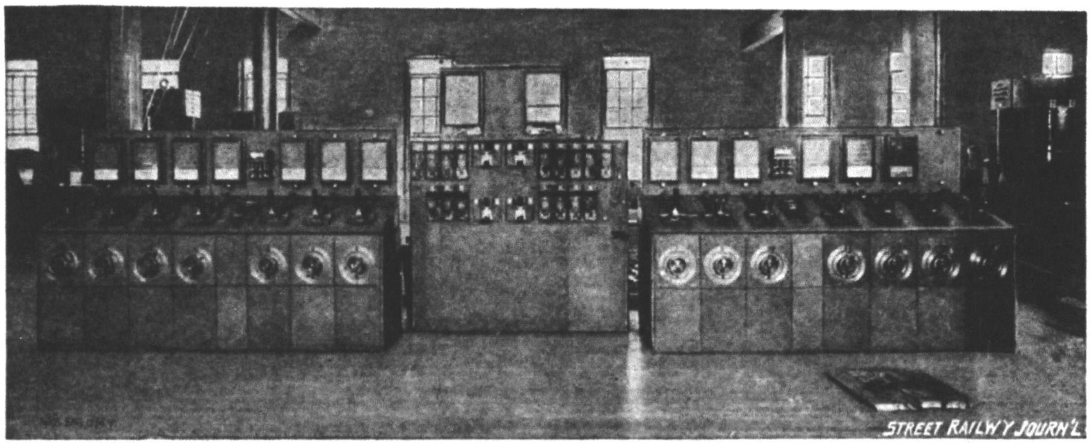

FIG. 4.—SWITCH BOARD—ST. PAUL ELECTRIC RAILWAY STATION.

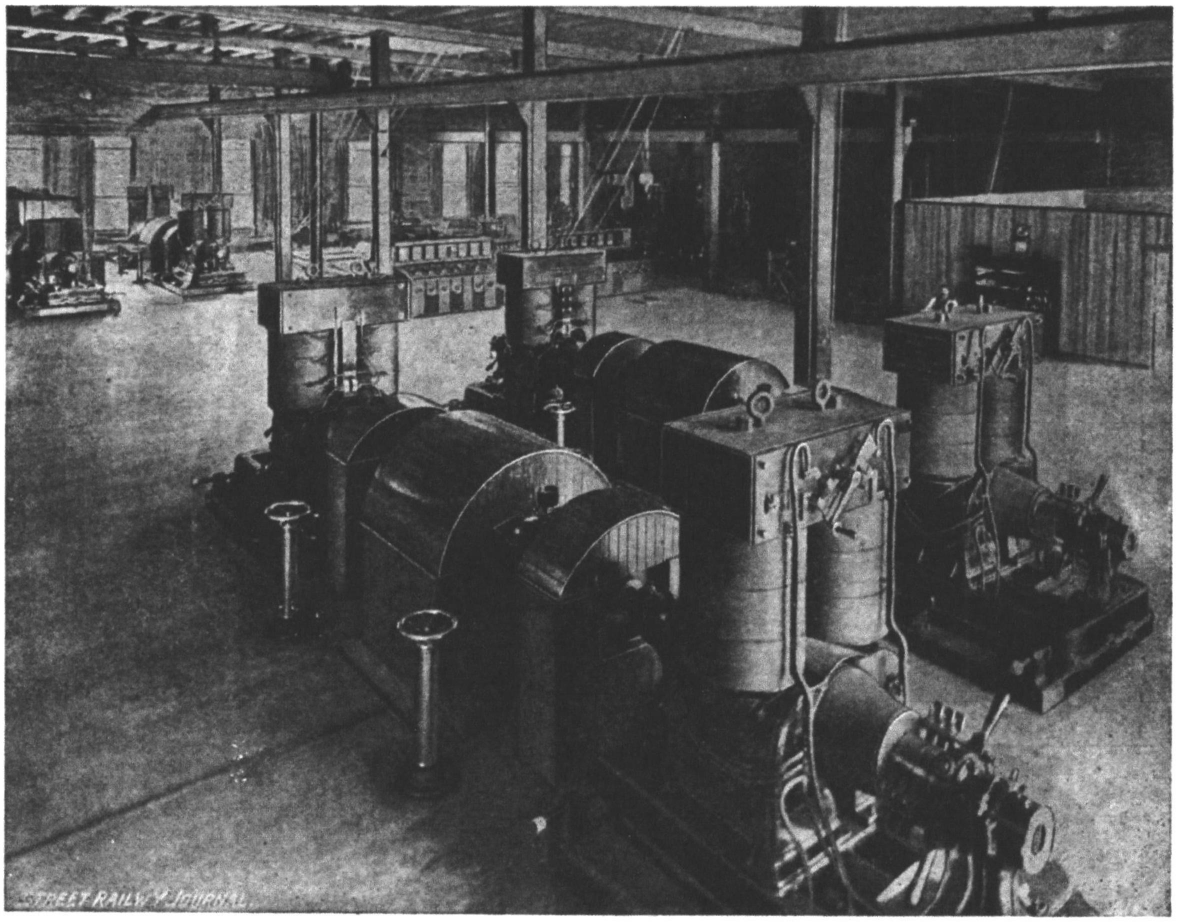

FIG. 5.—INTERIOR OF DYNAMO ROOM—ST. PAUL ELECTRIC RAILWAY STATION.

The car house of the Minneapolis system, of which a one-half front view is shown in Fig. 11, is 330 ft. front on First Avenue, northeast, by 200 ft. deep, and contains thirty tracks. The half toward Fourth Street, northeast, is provided with pits under each track for the cleaning and repairing of motors. In order to obtain as many tracks as possible, and at the same time allow the cars to enter the building squarely, the house was set back ten feet from building line, and provided with a ten foot vestibule, giving thereby fifty-five feet between the nearest track and the doors.

The set of curves laid for entering this car house, was designed by engineer W. F. Carr, of the Minneapolis Street Railway Co., and is shown in Fig. 12. This plan shows the main line on Central Avenue and its connecting track, with the loop and car house track, the inside curve being used exclusively as a loop for all East side cars, the outside for cars only when entering or going out from car house.

As shown, one-half of the entrance curves enter from

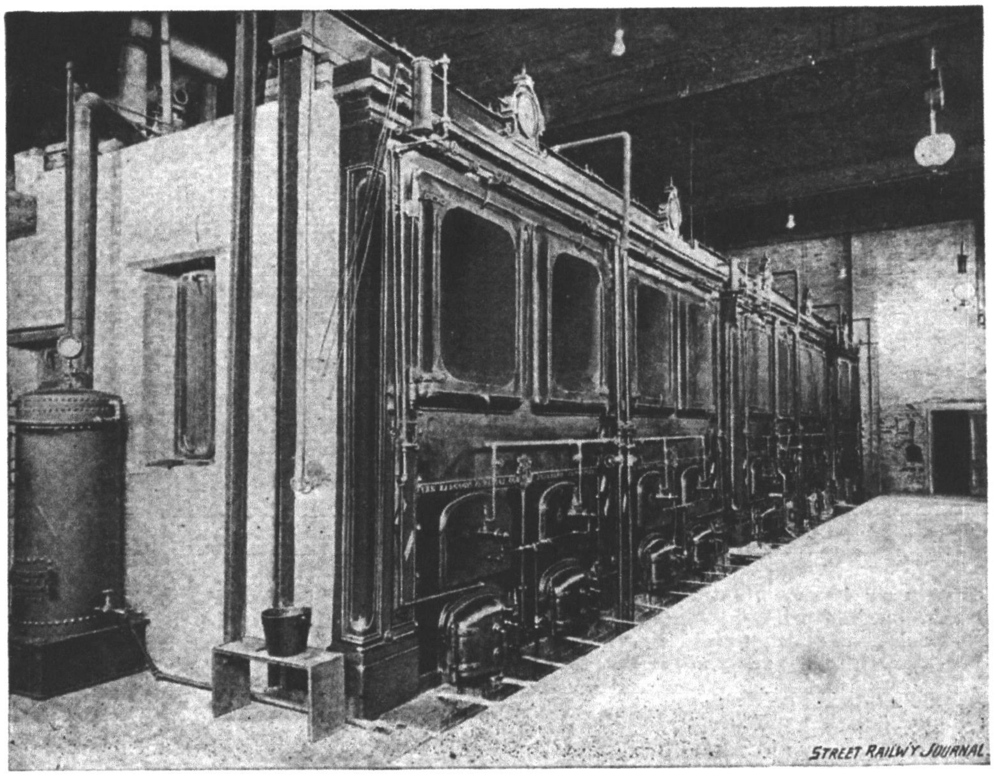
STREET RAILWY JOURNAL

FIG. 7—BOILER ROOM—MINNEAPOLIS ELECTRIC RAILWAY STATION.

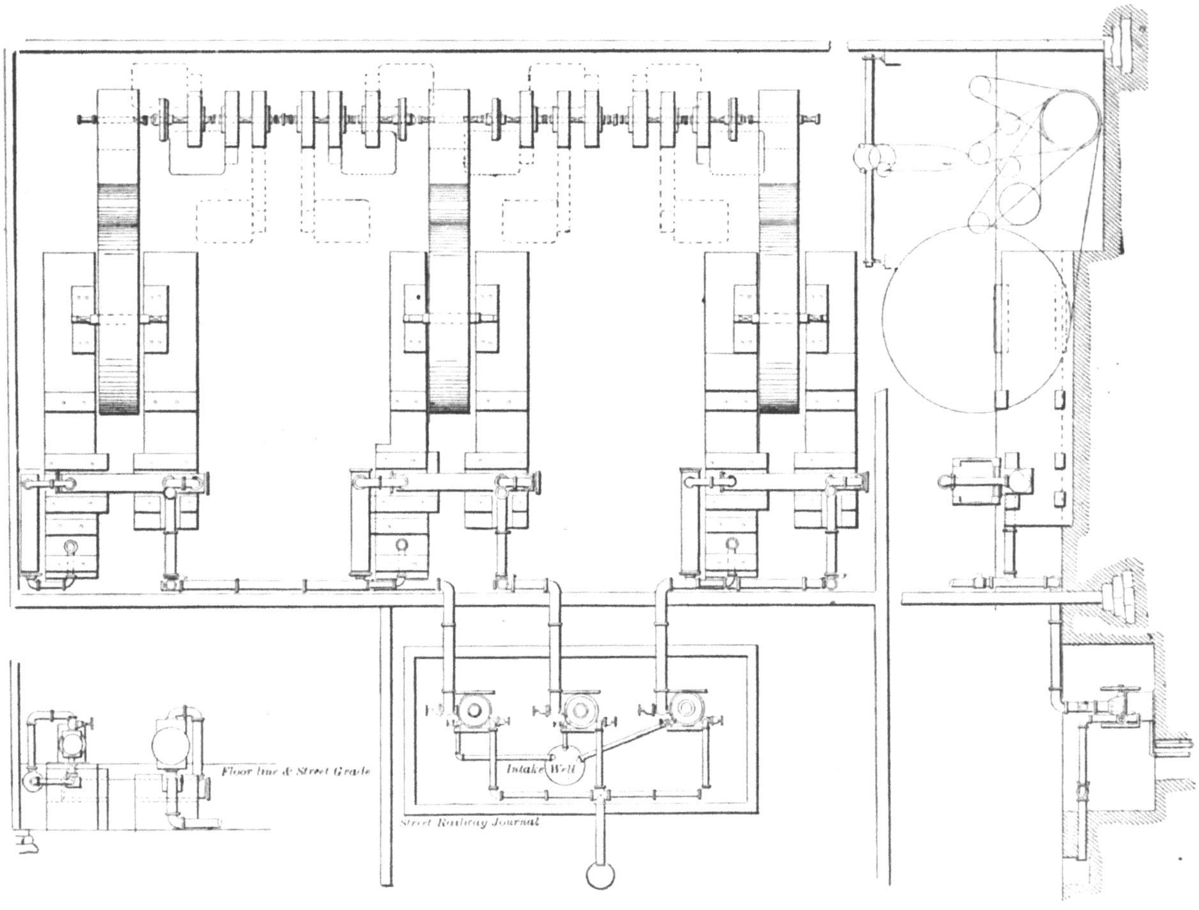
Floor line & Street Grade
Intake Well
Street Railway Journal

FIG. 6.—PLAN OF POWER STATION—MINNEAPOLIS STREET RAILWAY.

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Fourth Street, northeast, the other half from Third Street, northeast, each half consisting of five sets of curves, and each set of three single curves. All sets of curves converge so as to join the main track with a single switch and mate, and are identical in every respect, having the same radii, tangents, switches, frogs, etc.

The radii of the single curves are respectively forty feet for the outside, fifty feet the middle and forty-five feet the inside, and unite as shown in sketch. The tracks in car house are ten feet seven inch centres between single curves, and ten feet ten inches between each set. The angles subtended by each curve are as follows: In the forty and fifty feet radius curves the central angles are sixty-one feet while in the forty-five foot radius the central angle is ninety feet. The curves are all made of Johnson girder rail by the Johnson Co., the five and one-half pound section being used for

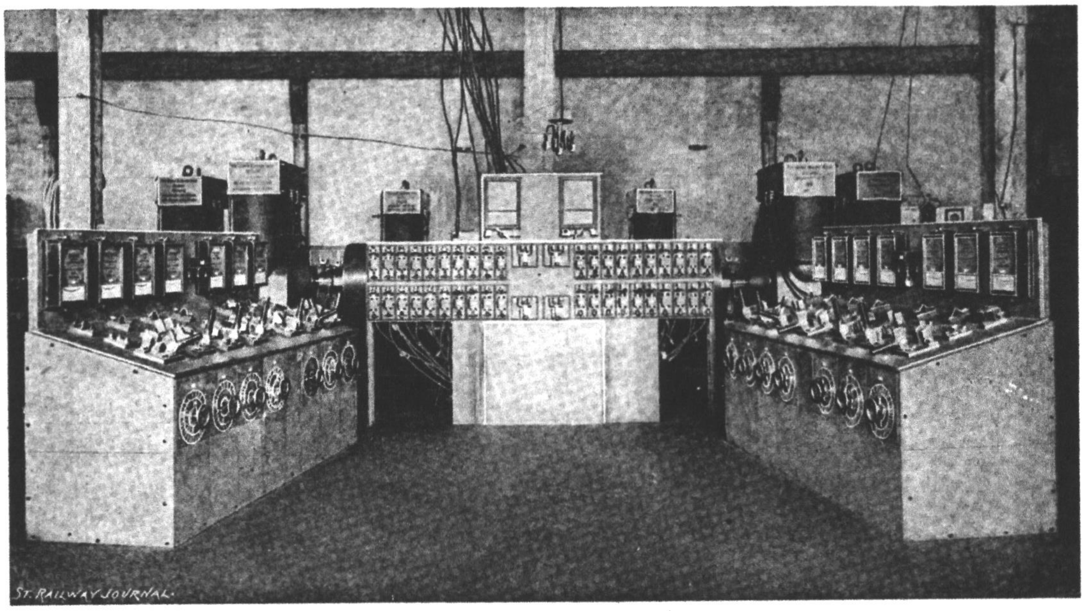

FIG. 9—SWITCH BOARD—MINNEAPOLIS ELECTRIC RAILWAY STATION.

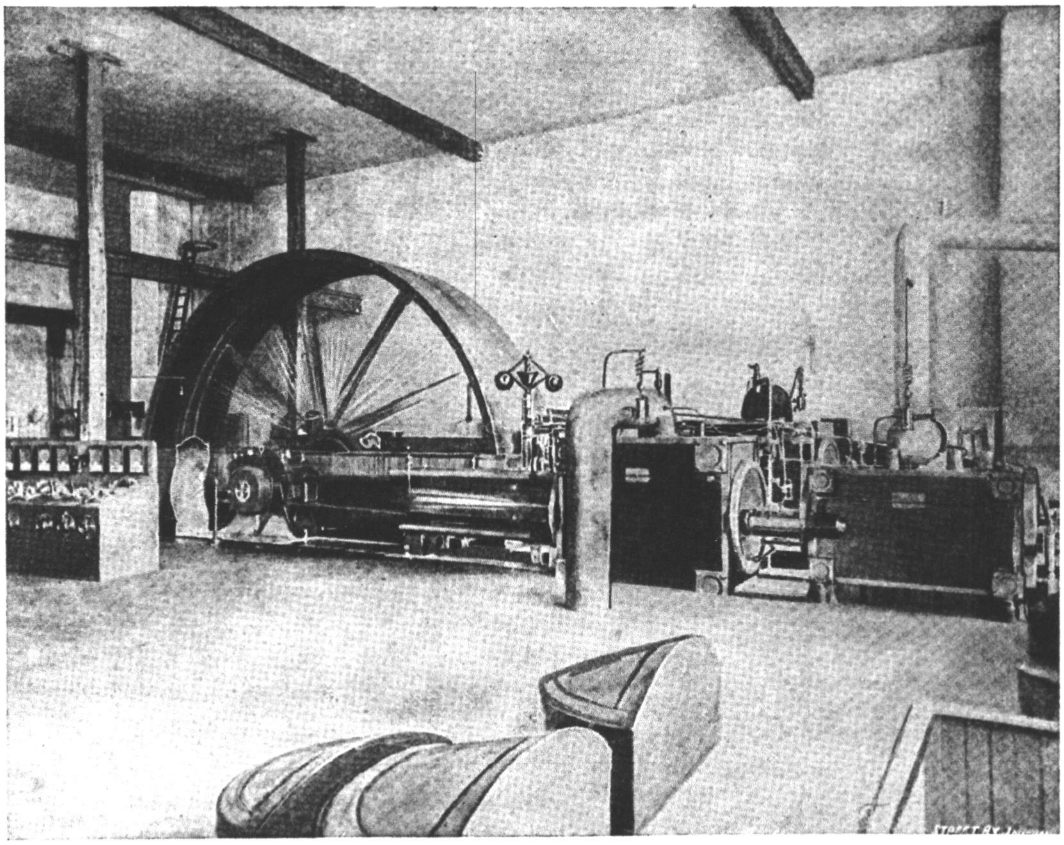

FIG. 8.—INTERIOR OF ENGINE ROOM—MINNEAPOLIS ELECTRIC RAILWAY STATION.

the outer and the seventy-five pound guard for the inner rail.

The entire work consisted of 264 pieces, and the engineer states each piece was plainly and carefully marked, causing no delay whatever in the construction.

The main idea in the study of these curves was to obtain as large a number of tracks as possible in the carhouse, and overcome the great objection of running through a vast number of switches and frogs. By this design turn tables are done away with, and cars are handled without the least difficulty or detention.

The company with commendable enterprise have lighted their entire line to Lake Harriet, a favorite resort a few miles from the business district, with arc lights. The current is furnished by an Excelsior machine situated in the main station.

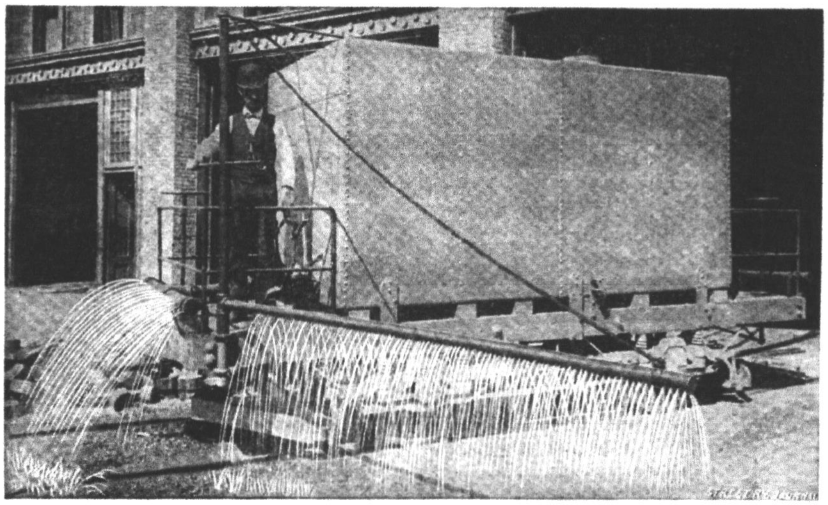

FIG. 10.—SPRINKLING CAR—MINNEAPOLIS STREET RAILWAY.

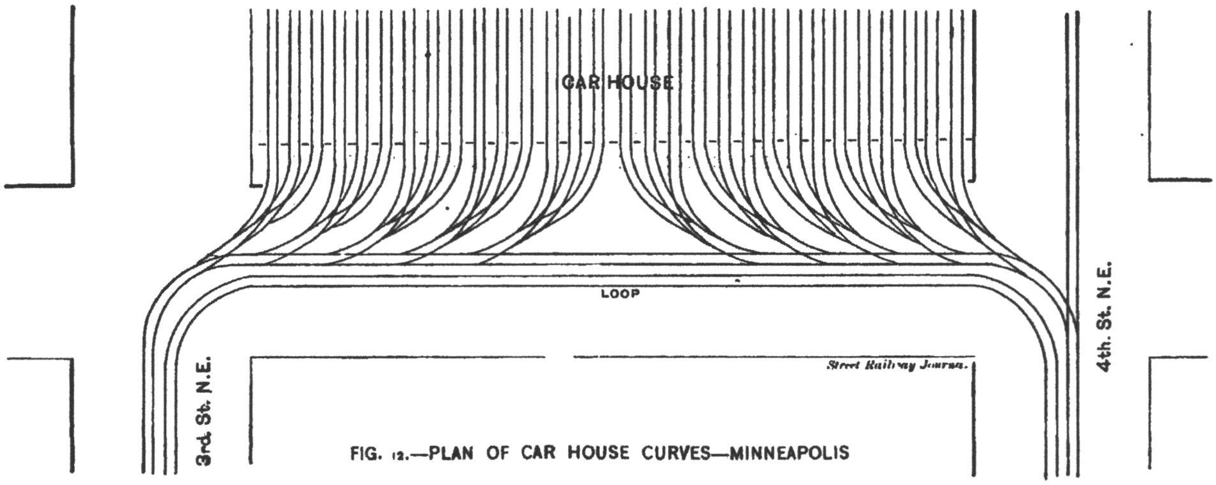

FIG. 12.—PLAN OF CAR HOUSE CURVES—MINNEAPOLIS

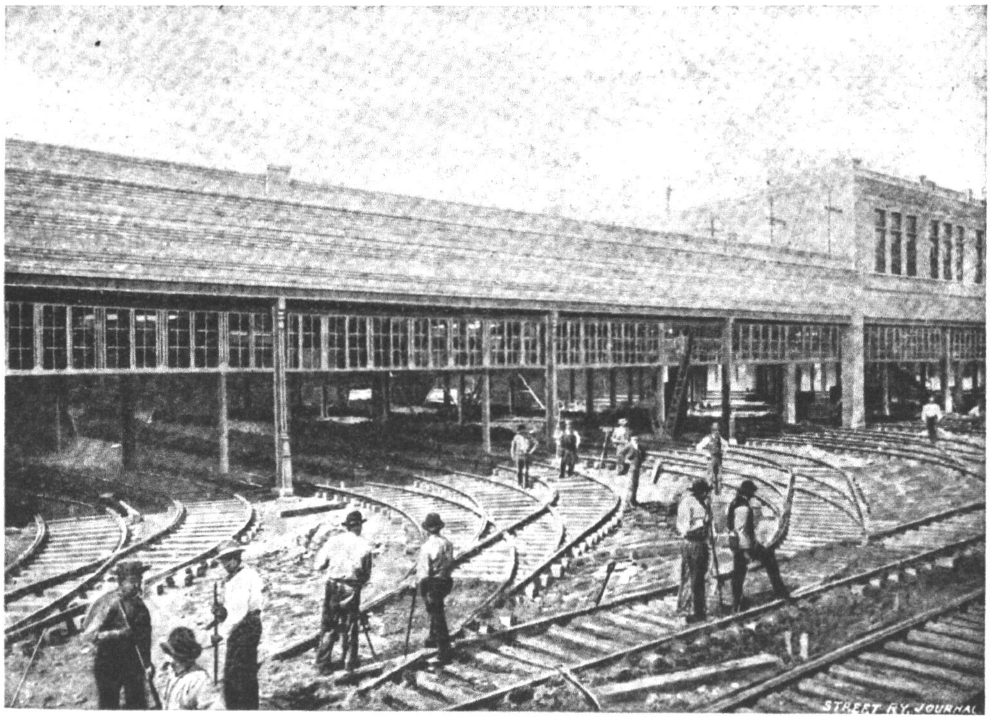

FIG. 11.—VIEW OF CAR HOUSE—MINNEAPOLIS STREET RAILWAY.

Travelling cranes are in use in both stations, facilitating the erection of machinery to a great degree.

Considerable has been done in laying the feeder wires underground in this system, the underground tubes of the Interior Conduit & Insulation Co., of New York, being employed. The length of the tubes at present employed is 400,000 feet, and repeated tests have shown a very high insulation for the entire system.

The belting for the St. Paul plant was furnished by the Chicago Belting Co. of Chicago.

The liberal policy which has characterized the management of the system since its in

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ception has done much to increase its popularity and profits. Extensions are being made in all directions and the work is progressing as rapidly as possible.

Great credit is due to the efficient management of Mr. Goodrich, and to the engineering department under the direction of Mr. W. F. Carr, for the able manner in which the work of this department has been prosecuted.

The Wightman Trolley Wire Insulators.

In our last issue we brought before our readers a description of the Wightman single reduction motor, and we are now enabled to illustrate some of the details of the Wightman system.

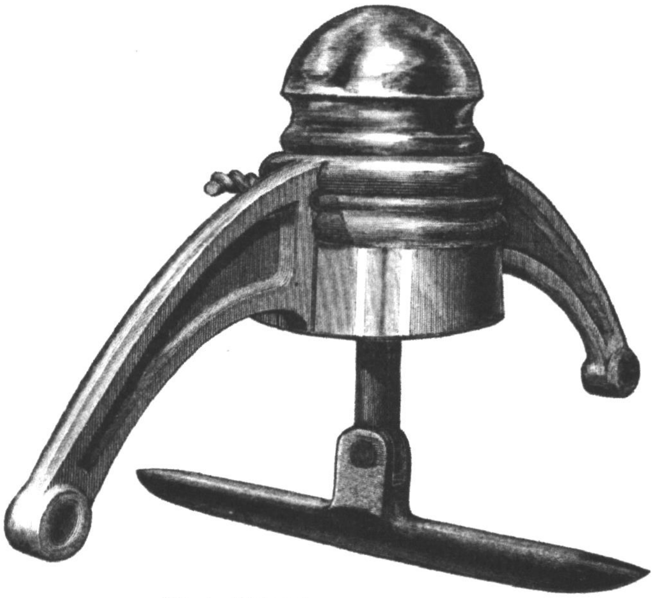
FIG. 1.—WIGHTMAN CURVE HANGER.

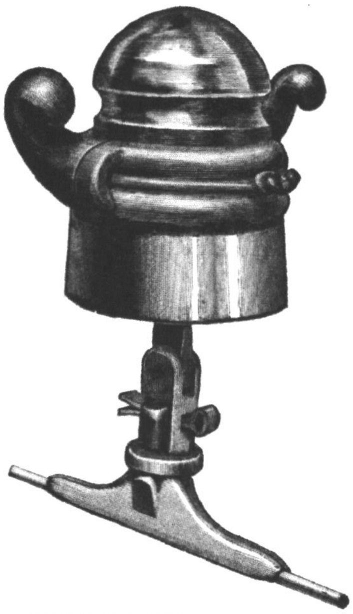
FIG. 3.—WIGHTMAN STRAIGHT LINE HANGER.

The engravings show the trolley wire insulators manufactured by the Wightman Electric Manufacturing Co. A peculiar feature of the construction of these insulators is the use of glass as the insulating medium. The choice of glass was made after an experience of several years in street railway construction, and after repeated trials of other materials, such as wood, vulcabeston, hard rubber, and moulded mica-shellac. Each of these insulating mediums is valuable in its proper place, but the Wightman company claim that they have not proved suitable for use in a trolley wire insulator. Telegraph and electric light companies have settled upon glass and porcelain after many trials of other materials, and have found these the only insulating mediums that do not deteriorate under outdoor climatic influences. The difficulty in the use of glass has been due to its brittleness and lack of strength, but by enclosing the insulator in a metal shield, the Wightman company claim that they have succeeded in protecting the glass so that it will withstand the heavy strains and blows to which it is often subjected on account of derailments of the trolley. The style of glass insulator used is that known in the market as the "pony" insulator. The cost to replace a broken glass is about two cents.

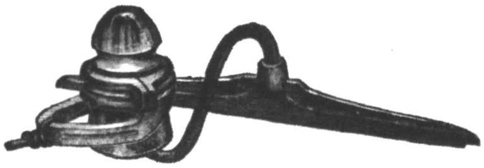
FIG. 2.—WIGHTMAN PULL-OFF.

Fig. 1 shows a curve hanger, Fig. 2 a pull-off, and Fig. 3 a straight line hanger. The glass is held in place in the metal shield without the use of screws or bolts. The shell is divided into two pieces, between which the glass is inserted and tied in position by means of a stout piece of wire, the ends of which are twisted together with pliers. In this way a fastening is secured which cannot be loosened by jarring or vibration.

The Wightman trolley wire clamp, which has been termed "La Grippe," is shown in Fig. 4. With this clamp the insulator can be put in place within the space of a few minutes. The halves of the clamp act like a pair of shears, and the clamping action is obtained by means of a small steel wedge in the shape a split key. After the wedge has been driven home, the ends are separated to prevent loosening.

The Wightman insulators have been in use on several large roads during the past year, and the manufacturers state that not a single instance has been recorded where the trolley line has fallen on account of a broken insulator.

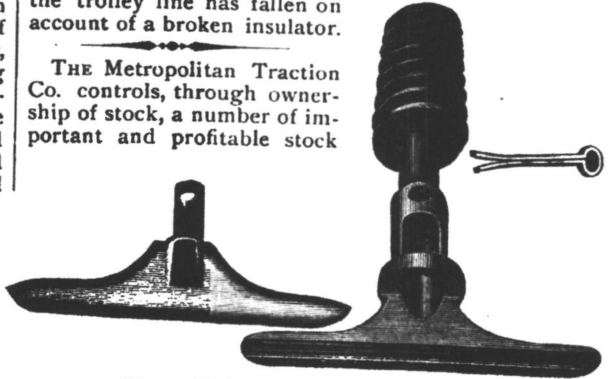
FIG. 4.—THE "LA GRIPPE" CLAMP.

THE Metropolitan Traction Co. controls, through ownership of stock, a number of important and profitable stock railway lines in the City of New York. The capital of the company is $20,000,000, par $100. No bonds. The capitalization of the companies controlled, and proportion thereof owned by the Metropolitan Traction Co. are shown in the following schedules:

	Stock.	Bonds.	Stock owned by Met. Trac.
Broadway & Seventh Ave.	$2,100,000	$2,100,000	$1,400,000
Twenty-third Street	600,000	300,000	330,000
Houston, West St. & Pavonia Ferry	250,000	500,000	All.
Broadway Surface	1,000,000	2,500,000	"
Chambers Street	800,000	none.	"
South Ferry	1,000,000	350,000	"
Metropolitan Crosstown	600,000	600,000	"

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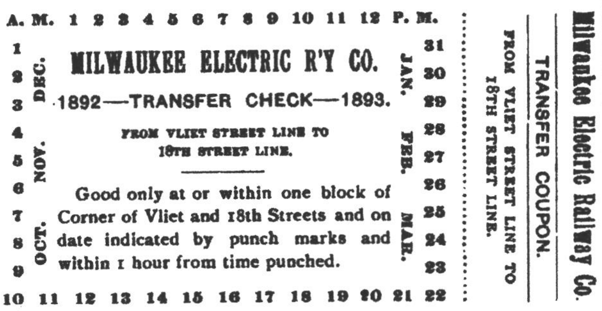
gine, built by the E. P. Allis Company, furnishes the power. This engine has been run continuously for over three years, and has never been shut down but once for repairs, thus having a most excellent record. The same is true of the boilers. In fact, wherever we go, we find that the Hazelton boilers are giving good satisfaction.

TRANSFERS AND TICKETS.

Transfers are given over connecting lines of the same system. The transfer tickets (Form A) are printed in three colors to designate the different lines. The issuing conductor punches the month, day and hour, and retains the coupon, which has no value, but which he returns to the receiver's office and gets new transfer tickets for it. The receiving conductor registers the transfer the same as a fare. By this arrangement there can be no collusion between conductors for an improper use of transfers; the ticket cannot be used the second time and cannot be duplicated. The regular fare is five cents, or twenty-five tickets for $1; childrens' tickets three cents. There are also employes' tickets, and complimentary tickets are issued to policemen, aldermen and city officials.

(FORM A.)



A. M. 1 2 3 4 5 6 7 8 9 10 11 12 P. M.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

DEC. NOV. OCT. JAN. FEB. MAR.

MILWAUKEE ELECTRIC R'Y CO.

1892—TRANSFER CHECK—1893.

FROM VLIET STREET LINE TO
18TH STREET LINE.

Good only at or within one block of Corner of Vliet and 18th Streets and on date indicated by punch marks and within 1 hour from time punched.

FROM VLIET STREET LINE TO
18TH STREET LINE.

TRANSFER COUPON.

Milwaukee Electric Railway Co.

The conductors and motormen exchange duties, alternating every two weeks from conductors to motormen, and *vice versa*. The conductors and motormen are also required to spend three nights a week in the repair shop till they become familiar with every electrical detail.

This line has been operating for some time at a loss, and is now in the hands of a receiver. G. J. Melms, formerly general manager, is acting as receiver. The road is soon to be sold on foreclosure proceedings, and will probably be absorbed by the Milwaukee Street Railway Company's system.

Minneapolis and St. Paul.

The "twin cities," so called, although ten miles apart, with their combined population of 350,000, offer an inviting street railway field, which is well occupied; and, as may be expected, from the reputation of the men at the head of the rapid transit companies, the service is most admirable. In fact, in many respects the service is superior to any that we have before found in our tours of observation. In making the rounds of repair shops, power stations, car barns, storerooms and even on the cars, it was noticed that a condition of scrupulous cleanliness prevailed. There was no scrap or dismantled motors lying about for the workmen to stumble over, but there was a place for everything (even for dirt and scrap) and everything was in its place. After repeated inquiry as to who was responsible for this condition of affairs, it was learned that the president, Thomas Lowry, and Vice-President C. G. Goodrich, had *indicated* their preference for order and neatness in all the departments, and every foreman had become imbued with the same spirit. At any rate these things were in striking contrast to the condition of affairs on some other lines, and as the service on these lines was equally efficient in every direction, it may be inferred that the success of any management can be measured quite accurately by observing these particular points.

On arriving in Minneapolis and calling at the company's office, we were cordially received and handed transportation books, good on the lines of both cities, and one of the heads of departments was detailed to accompany us on our rounds to the power houses and over the lines.

TRACKS.

The lines of the two cities embrace 250 miles of single track, of which ten miles are operated by cable and the balance by electric power. The tracks are laid in part with seventy-eight pound, six inch girder rail, spiked direct to the ties, and a sixty pound, five and three-quarters inch T rail of special design, joined with long and deep splice bars. Tracks laid with the T rail give the best satisfaction, and this has been adopted as the standard and is being laid on the paved streets as well as on the suburban lines. While there has been no special ordinance allowing the use of T rails on the paved streets, the city authorities do not object to their use, and they are also acceptable to the general public as they do not interfere with vehicular traffic. The rails are laid on wide hewn ties, spaced two feet apart. An inch board is placed above the ties on which the paving rests, and an inch strip is placed on the inside of the rail to provide a space between the T rail and paving for the wheel flange. The importance of using wide ties was strikingly illustrated by an experiment made on the interurban line between Minneapolis and St. Paul, where T and girder rails were laid upon six inch sawn ties, but the track went down, the ties sinking into the soil, so that it became necessary to relay the track with wide hewn ties, which were laid close and thoroughly tamped, and the girder rails replaced by T rails. The joints, however, on this line need constant attention, and are a little low in some places. In both cities a number of the electric lines converge to one point and make a common loop over which most of the cars pass. From the common center the cars are dispatched at proper intervals.

CARS.

Nearly 700 cars are operated on these lines, including the summer equipment. 100 of these are eighteen foot cars, manufactured by J. M. Jones' Sons. Sixty open and sixty closed cars were manufactured by the Laclede Car Company, and a large number by the Northern Car Company.

The twenty interurban cars were manufactured by the American Car Company. These are vestibule cars, forty-one feet over all, with seats for forty-three persons. These cars are equipped with rattan cross seats, and are very highly finished. They are run always with the same end forward. The forward vestibule is a cab for the motorman, and the Spear heater, with which the car is warmed, is placed in the forward partition, so that the cab is warmed as well as the interior of the car. The rear vestibule is closed on one side, so that the passengers enter at the corner, circular steps being provided. Owing to the extreme cold weather, the company has found it necessary to put in a double floor and double windows in these cars, which make the long (fifty-five minutes) trip between the two cities. The window curtains on these interurban cars are mounted on ordinary rollers, but are held in any position by means of adjustable rubber tips at the ends of the curtain stick, which engage with the face of the slide in the posts. By means of clips on the under side of the hollow curtain stick the rubber tips are freed from contact with the slide, and the curtain may be raised or lowered. This device is manufactured by the Burrows Car Shade Company of Portland, Me., and it is a very desirable street railway appliance.

TRUCKS AND WHEELS.

The interurban cars are mounted on the Bemis No. 29 pivotal trucks, which are giving excellent satisfaction; some of them, however, have been changed from side to center bearing. Bemis trucks are employed, for the most part, on all the cars. In some cases the trucks have been remodeled, and the spring base extended to suit the particular cars and conditions to which the trucks are subjected. This type of truck is in high favor with the management.

A thirty-three inch wheel has been adopted as the

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standard, after experiments made with the thirty and thirty-six inch wheels. The latter were particularly hard on the axles, resulting in a number breaking while rounding curves.

The Allen paper wheel is employed on most of the double trucks, while five of the interurban cars are equipped with the cushioned wheel manufactured by the Cushion Car Wheel Company, of Indianapolis. The cast wheels are mostly of Whitney's make, while some were made by the Northern Wheel & Foundry Company, of St. Paul, this company having recently moved from Milwaukee to St. Paul.

MOTORS.

The interurban cars are equipped with two twenty-five horse power, Thomson-Houston motors. The other equipment consists, for the most part, of the Edison double reduction, fifteen horse power motors. There are, however, a few double reduction, Thomson-Houston motors, and some of the W. P. type, of twenty-five horse power. The latter are giving the best satisfaction. The double reduction motors have nearly all been made over in the company's shops, and are operating with a higher efficiency and with less repairs, than formerly. The winding of the fields has been changed, and a larger armature shaft has been substituted.

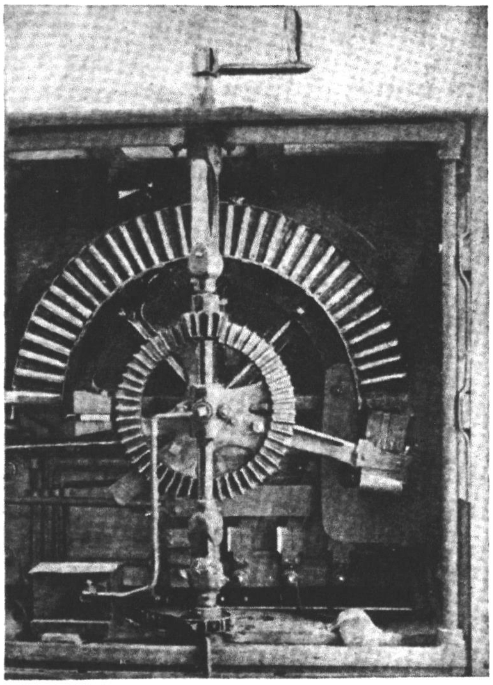

FIG. 1.—PLATFORM RHEOSTAT—MINNEAPOLIS.

Considerable saving has been effected in rheostat repairs by boxing it in on the front platform against the dash, as shown in Fig. 1. In this position it is not exposed to moisture, and is readily accessible for repairs. The brush is operated by a handle on the top of the box, and motion is communicated to the brush by means of a vertical shaft and beveled gear. The extremities of the shaft are of wood and are joined to the iron portions by a thimble and key or rivet. A sprocket wheel on the lower end of the shaft transmits, by means of chain and cable, motion to the rheostat on the rear platform. The reversing switch handle is to the left, not shown in the figure. This arrangement is working very satisfactorily.

POWER STATIONS.

The electric lines are operated from three power stations, two being located in Minneapolis and one in St. Paul. The cable lines are operated from two stations in St. Paul. The main station, from which the Minneapolis lines are operated, is on Third Avenue North, and in the same building are the company's offices and the car repair shop. This station was illustrated in our September, 1891, issue, and, as will be remembered, the power equipment consists of seven boilers, two of which are of the Stirling type and five of Babcock & Wilcox make. Oil is burned for fuel. There are two 1,200 H. P., triple expansion engines and one 300 H. P., all of the E. P. Allis Company manufacture.

Cracks having recently developed in some of the spokes of the flywheel of the small engine near the rim, it has been found necessary to replace it with a heavier wheel. While this engine is idle the station is without any reserve power, as both the larger engines are in continuous operation. The engines are coupled by belting to a countershaft beneath the floor, from which belts transmit the power to the sixteen 175 K. W., Edison generators. The belting was manufactured by W. S. Knott & Company, of Minneapolis.

The engine room is light and airy, the ceiling which formerly covered it having been removed, leaving it open to the roof. This was rendered necessary in order to secure sufficient ventilation for the machines. This will serve as a hint to others in planning power stations. There should be plenty of head room for ventilation and light.

The switchboard of this station is located near the middle of the room, and is divided into three sections, which make an obtuse angle with each other, and so arranged that the attendant can see all the switches and meters from his desk in front of the middle board. All the feeder switches are placed on the middle board and the line switches on the other two. The cables are all carried beneath the floor. It is the intention of the chief electrician, A. W. Morrell, to so arrange the circuits that any one of the generators can be coupled direct to any of the lines, so that when necessary a higher voltage may be employed on any individual line.

The generator room is equipped with a traveling crane for handling the heavy parts, and there is also a lighting generator of the Excelsior type, which operates 100 arc lamps of 2,000 C. P., and a large number of incandescent lamps which light the stations, car barns, repair shops and offices. The output of this machine is regulated with a very ingenious governing device, and the generator is operating with great satisfaction. There is a second machine of the same type in No. 2 power house, and by means of specially designed switchboards the lights may be run by either one or both of the generators. A simple and ingenious device was noted on the lighting generator for conducting the static electricity generated by the belts from the fields to the earth. This consists of a strip of cardboard four or five inches long, clamped between the field and the ground wire, on which is a lead pencil mark, which contains sufficient carbon to conduct away the troublesome current.

No. 2, or the 31st Street power house, is illustrated and described on page 105.

REPAIRS AND RENEWALS.

Since the company began operating with the Edison equipment, two years ago last October, the company's engineers have made important changes in generator armatures, and in the motors. All the generator armatures have been remodeled and rewound. The commutator bars have been lengthened, and the construction of the core has been materially changed, so that the tendency to heat has been reduced, and not a burn-out has occurred since the changes were made. The same is true with the double reduction motors. A larger shaft has been substituted, the gear reduction has been changed from twelve to one, to nine to one, the winding of fields has been changed, and the motor is now working satisfactorily, with a good degree of efficiency, and a minimum of expense for repairs. Rawhide is used principally for armature pinions, and bronze intermediate pinions are employed.

Some of the improvements in overhead appliances consist in providing a drop forged steel ring for the bell hangers, so that they do not break, as formerly, and the substitution of a trolley splice which was invented by the

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general manager, W. J. Hield. Material for overhead repairs is issued on a requisition made by the foreman and approved by the electrical engineer; and the foremen, in their daily reports, are required to make returns for the old material, the value of which is credited to the supply department. Formerly the workmen took possession of the old material, which they sold to junkmen, resulting in quite a loss to the company, a deal which the new arrangement corrects.

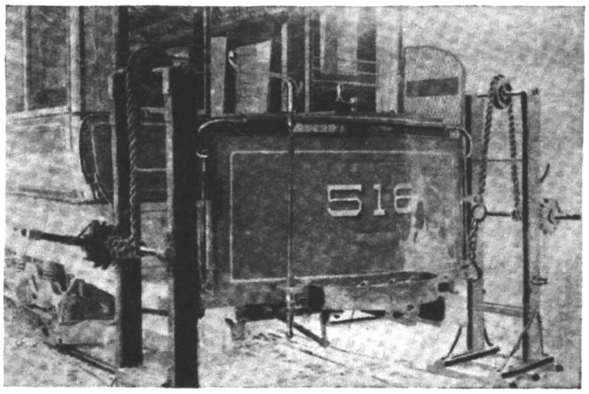

FIG. 2.—CAR JACK—MINNEAPOLIS.

REPAIR SHOPS.

The car repair shops are located at the Third Avenue station, and the iron shops are at the 31st Street station. The former are conveniently arranged with a good equipment of wood working tools, mostly of Fay's manufacture, which are located on the ground floor, and operated by power from the main station. The carpenters' benches, erecting and paint shop are on the second floor. The carpenters' benches are arranged parallel to each other, to one side of the shop, and system, order and cleanliness prevail, as before noted.

A very convenient jack for raising the ends of cars is employed in this shop, and is illustrated in Fig. 2. One man can move and operate them, and they are frequently employed on the line for handling disabled cars. The Third Avenue station, including the car shop and offices, has recently been equipped with the Grinnell dry pipe, fire sprinkling system, having 1,041 sprinklers. The water is taken from the city mains which carry sixty pounds pressure, and this is supplemented by a steam pump and reservoirs.

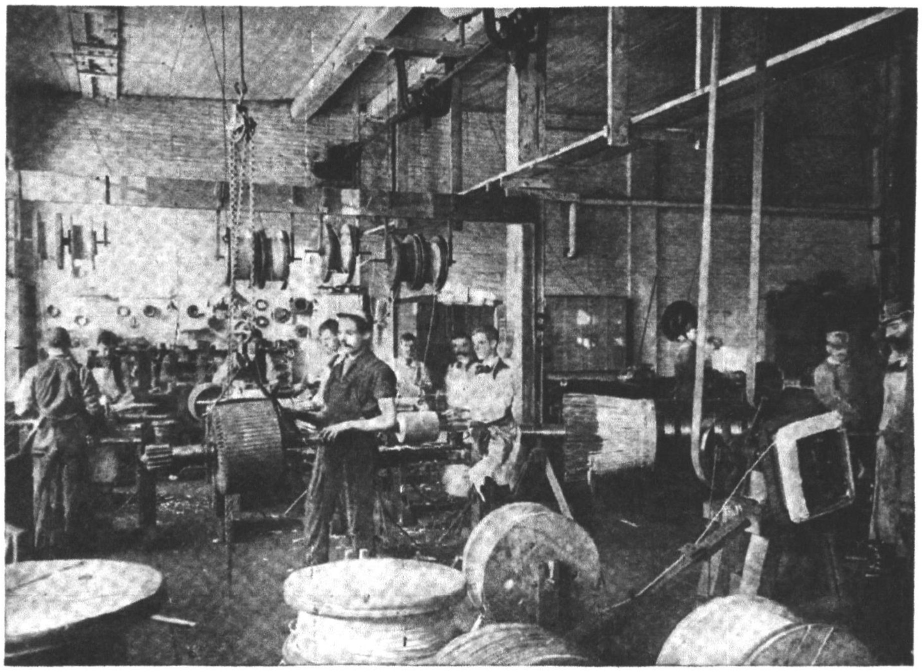

FIG. 3.—WINDING DEPARTMENT OF REPAIR SHOP—MINNEAPOLIS.

The iron shops are more extensive (150 × 125 ft.) and better equipped than any which we remember to have seen. Among the tools we note three Gould & Eberhardt gear cutters with flexible shafts, one planer, two shapers, six drill presses, twelve lathes, emery grinders, two milling machines, a special turret nut machine, a wheel boring machine, two wheel presses, one key seating machine, axle lathes, etc. A large tool room is railed off in which are a number of special machines for making the cutting tools and drills, and the whole arrangement is modeled after the practice of large manufacturing establishments, giving facilities for the manufacturing of armatures complete, and repairs of nearly every street railway appliance. A brass foundry has recently been added, having a daily capacity of 1,000 lbs. of metal. About fifty men are employed regularly in the repair shop and twenty-eight in the winding department, a view of which is shown in Fig. 3.

The blacksmith shop adjoins the repair shop, and the equipment consists of one Bradly hammer, one steam hammer, seven forges, and a number of small tools.

The trolley poles, which are of ash, are here manufactured. The conducting wire is spirally wound about the pole, giving sufficient length for splicing when necessary.

STOREROOMS.

The 31st Street station is built on three sides of a block, and that portion fronting on 31st Street is three stories in height and is occupied as offices by the material accounting department and storerooms. The heavier material, such as wire reels, wheels and fields, is stored on the ground floor, while the second and third floors are utilized for the lighter parts. The rooms are equipped with rows of double shelving and bins, thus providing for the classification and housing of the almost endless number of parts. The amount of surplus stock carried by this company is surprising. It is in fact equal to that carried by some of the electrical supply companies. The rooms are warmed by steam heat, and there are elevators and every appliance for the convenient handling of stock. It is needless to say that they are models in their way.

TRANSFERS.

Nearly all the Minneapolis lines converge to one point, most of the cars passing over the loop, from which point they are dispatched by special agents. Transfers are given on nearly all the lines, and for this purpose agents are stationed at three or four different points for the purpose of issuing transfer tickets. These tickets are punched for the purpose of indicating the day and hour of issue, and are limited to a brief period. At each of the transfer stations small circular booths are erected on the sidewalks near the corner, for the convenience and comfort of the agents. These are provided with a stove, clock, table and other conveniences, and some of them are

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occupied by the receivers to whom the conductors make their returns.

The transfer system is very acceptable to the public, and the officers of the company are of the opinion that it is a benefit to the company in the way of increased receipts and satisfactory service.

On the interurban line two fares are charged for through passengers, and on some of the cars a United States mail box is placed in which letters may be deposited, and from which they are collected by the post office employes at stated intervals.

FEED WIRES.

Nearly all the feed wires from the different stations are carried along the streets in subways, the cable being housed in the Interior Conduit material. This material and the insulation is proving very durable, but some trouble with burn-outs is experienced at the manholes, owing to a faulty construction of the manhole boxes. The interior box being constructed independent of the outer, allows of its being raised up by frost pressure and other causes, so that the cable openings are not in line, and the insulation becomes chafed and some trouble results. An overhead feed wire is provided on some lines for use in case the underground wires should fail.

In the track construction the rails were double bonded, but no return wires were employed except on one line. It is the intention of the company, however, to put in return wires. The rail circuit is grounded near the station by sinking in a driven well, forty-five feet deep, four square feet of plate copper which is rolled into a cylinder and connected by wire to the rail. Old car wheels with rail connections are also sunk in the ground at intervals of 1,000 ft. along the lines.

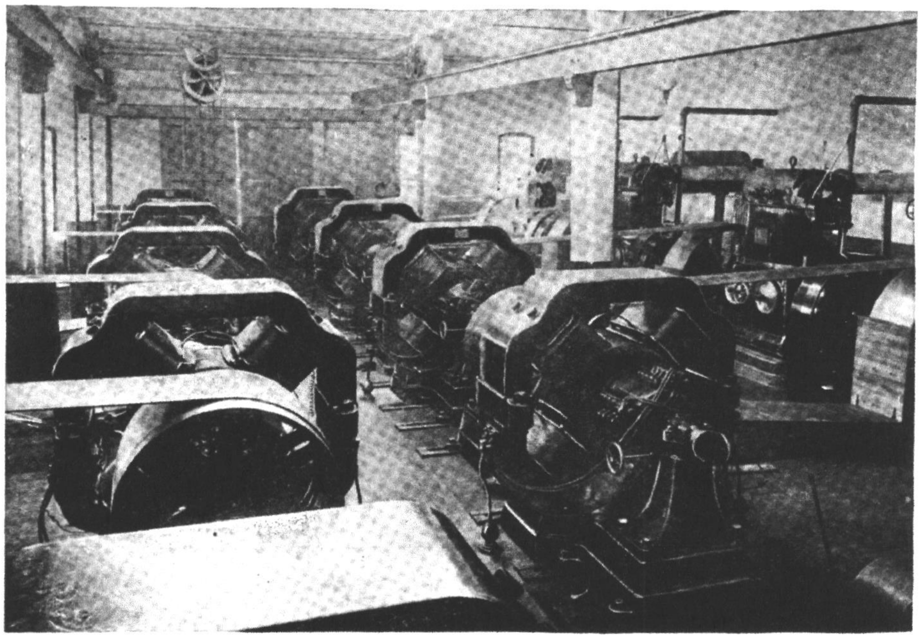

FIG. 4.—INTERIOR OF 31ST STREET STATION—MINNEAPOLIS.

The current for operating the interurban line is supplied from the Minneapolis and St. Paul stations, the conductor being divided at the bridge near the center of the line, the right hand wire from each city reaching across the bridge.

The overhead construction is supported in Minneapolis and on the interurban line by iron, tubular, center poles, except on one line. Lattice poles are employed in St. Paul. The trolley is of No. 00 hard drawn copper wire. The electrician, however, would prefer No. 0.

The pay of the motormen and conductors on the electric cars is seventeen cents per hour and that of the gripmen and conductors on the cable cars twenty cents per hour. The men work from ten and a half to twelve hours per day, and do not belong to any labor organization.

POWER STATION NO. 2, MINNEAPOLIS STREET RAILWAY COMPANY.

This station, situated at 31st Street, was built some time since, but has only recently been put in operation except for one week, at the time of the Republican Convention. The power equipment consists of seven Stirling water tube boilers, of 280 H. P. each, in two batteries, facing each other, on the opposite sides of the boiler room, and under which oil is used for fuel, being fed by the St. Paul burners. The smoke flues lead down behind the boilers beneath the floor, thence to the smoke stack which is of brick, quite ornamental in shape, and of the usual height. A Hughes steam pump and a Wainwright feed water heater complete the equipment. The feed water is taken from a driven well 1,000 ft. deep, lined with tubes eight feet seven inches long and six inches in diameter, and in which the water rises to within fifty feet of the top. The pump is located thirty feet below the surface, and is reached by a spiral stairway, the upper portion of the well being enlarged for the purpose.

The oil storage tanks are sunk beneath the surface of the ground, and are located in the yard at the rear of the station. The oil is delivered direct from the tank cars, a siding being provided for the purpose.

Ten Westinghouse compound engines, of 250 H. P. each, furnish the power. The engines are arranged in fives on the opposite sides of the room, and nine of them are each belted direct to a 270 K. W., M. P., Thomson-Houston generator (Fig. 4). The belts are each twenty four inches wide, and were manufactured by W. S. Knutt & Company, of Minneapolis. The tenth engine is belted to a 100 arc light generator, and to an M. P. 90 exciter which, with 600 volts, excites the fields of all the generators. The connecting cables from each machine are led beneath the floor to the rear of the switchboard which is located on a gallery, and extends the full width of the room. The exhaust pipes from the engines are laid beneath the floor, and connect with two large mains which conduct the steam to the heaters. The switchboard stands out free from the wall, with a wide passage behind it, and which is lighted by incandescent lamps. The feeder switches are located on the right hand portion of the board, the generator and line switches on the middle portion, and the lighting switches at the left. The bus bars are located on the back of the switchboard, and are composed of layers of copper plates, two inches wide and a quarter of an inch thick, graduated from one to ten in thickness, and are covered with an insulating material. Three lightning arresters are provided for each machine. The switch equipment is mostly of the Thomson-Houston type.

A novel rheostat was improvised recently for testing the efficiency of this plant. It consisted of half inch iron rods, connected together and coiled on the ground in the yard in the rear of the station.

As will be noted from Fig. 4, the station is conveniently arranged, and there is an overhead Shaw crane,

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manufactured by Manning, Maxwell & Moore, of New York. This station has sufficient capacity for operating the entire Minneapolis system, but will be run in connection with No. 1 station, described in another column.

The delay in putting this plant in operation was due to some defects in the direct steam pipes. The first equipment consisted of spirally welded steam pipes, which soon developed cracks along the weld, rendering them unsafe. These were replaced by the ordinary make of pipe of uniform diameter up to the steam chest. It was then discovered that there was a drop in the steam pressure between the boiler and the engines of more than fifteen pounds. This was thought to be due to the rapid pulsation of the steam in the pipe, caused by the cut-off coming close to the end of the pipe. This defect was almost entirely remedied by placing a large receiver in the the pipe a short distance from the engine. One of the engines, it will be noted in the view, is thus equipped.

ST. PAUL ELECTRIC POWER STATIONS.

The electric lines of St. Paul are operated from the Hill Street station. The building is located in the side of a steep hill near the Mississippi River, so that the third floor is reached directly from the street. The plant was illustrated and described in the STREET RAILWAY JOURNAL for September, 1891; hence a brief description must suffice in this connection.

The power is supplied by three 1,000 H. P., triple expansion engines, built by the E. P. Allis Company, which are located on the ground floor, and are connected each by two belts direct to the shafts of the generators, located on the floor above. The belts are forty inches wide, and were manufactured by the Chicago Belting Company. Each shaft carries three armatures, either one or all of which may be run at a time by means of Hill clutch couplings. There are sixteen Edison generators of 150 K. W. each, for providing power, and a Thomson-Houston eighty horse power generator for light and for keeping the line charged at night, so that in case of fire in the car barns, power would be available for running out the cars. This generator is driven by a 140 H. P. Buckeye engine.

Six Babcock & Wilcox boilers of 272 H. P. each generate the steam. Oil is used under one of the boilers, and is delivered at a cost of $2.60 per 100 lbs., and is fed by Boher burners, manufactured in St. Paul. The other boilers are fired with soft coal screenings that costs $1.75 per ton, and which is mixed with about 13 per cent. of hard coal screenings costing $3.20 per ton. A Goubert feed water heater and three Allis condensers complete the steam equipment. The water is drawn from the river through pipes extending out forty feet under the bed, with a lift of twenty-three feet.

The generator room is ventilated by means of a fan and a system of pipes so arranged that a cool blast may be turned on to the generator bearings when necessary.

Three sets of hose, each 200 ft. long, are provided for use in case of fire in the building.

It is estimated that it requires twelve electrical horse power per day per car to operate the St. Paul lines, and from eighteen to twenty horse power for the long interurban cars.

ST. PAUL CABLE STATIONS.

Two cable lines are operated in St. Paul, one from the Silby Avenue station and the other from a station on Seventh Street. Both stations are alike in their equipment, the driving machinery having been manufactured by the Robert Poole & Sons Company, of Baltimore.

At the Silby Avenue station the power is supplied by two Allis high pressure engines of 500 H. P. each, and the steam is generated by four tubular, double deck boilers of 250 H. P., manufactured by the Schuylkill Foundry & Machine Company, under which oil fuel is burned.

Two ropes are driven by solid drums geared together, one at a speed of eight miles an hour and the other at twelve miles, and the life of the ropes, which are of Roebling make, is about fifteen months.

Ten regular trains, consisting of open grip and trailer, are run. The cars were all manufactured by the Laclede Car Company. The trains are equipped with a Johnson continuous brake, and the trail car is provided with a special wedge brake or shoe having a rubber surface which comes in contact with the rail when in use. This brake is designed for emergency use on a 500 ft., 6 per cent. grade which occurs in the line. On ascending or descending this grade each train is boarded by a special brakeman stationed at this point, who uncouples the continuous brake chain and takes his position on the front platform with his hand on the lever of the emergency brake. These precautions were instituted after a runaway on this grade in which several people were injured.

The company proposes changing from cable to electric power on the Seventh Street line, for the reason that with the present traffic the cost for operating per car mile is greater than it is on the electric lines.

Omaha, Neb.

The lines of the Omaha Street Railway Company, which controls nearly all the traffic in the city, embrace eighty-five miles of track, of which sixty miles are operated electrically, seven by cable, and the balance by horses. About 100 horses are still in service. One line of about four miles, which was formerly operated by cable, has for some time been operated by electric power. The cable conduit still remains in place. This line was very crooked, so that it required a great deal of power to operate, and the traffic being light, comparatively, it is found to be more economical to operate by electricity; in fact it is claimed by the management that the cost for operating per car mile is less on the electric lines than on the cable line. Two car trains are run on the cable line on ten minutes headway. This is almost the first instance where we have found electric cars operated for less per car mile than cable cars. These lines also enjoy the distinction of operating electric cars at a less cost per car mile than any other lines with which we are acquainted, with one exception. Quite steep grades are encountered on some lines, and these are operated with motor cars only. On most of the lines, however, trail cars are hauled. A very high rate of speed is attained in the suburban sections.

Transfers are issued to all passengers coming into the city at the railroad depot and on cross lines, but none are issued between the lines that occupy nearly the same territory. Crosstown lines carry the passengers for one fare over the entire route. One line runs from North to South Omaha, a distance of ten miles, for one fare. Very few passengers, however, except pleasure riders in summer, complete the entire trip. Most of them leave and take the cars at the center of the city. In the opinion of the officers, transfers work to the advantage of the company. The fare is five cents. Children's tickets are sold fifteen for fifty cents. These are on sale only at the company's office. Children under ten years of age without tickets pay full fare. Celluloid checks are used for complimentary and employes' tickets.

TRACKS.

The cable tracks are constructed with a sixty pound girder rail, and after four years of service are standing up quite well, the joints having been but once overhauled. The electric lines are constructed for the most part with a forty-five pound girder rail resting on chairs with ties two and a half feet centers. During the past season the Johnson standard joint construction has been substituted for fishplate joints. The special work on these lines was made by the Weir Frog & Switch Company. The rails are bonded, but there is no return wire. These stations also supply power for operating two cars on the line of the East Omaha Land Company.

POWER STATIONS, GENERATORS AND MOTORS.

The lines are operated from two electric power stations and one cable station. The first of the electric lines was started in 1889. There is also an auxiliary electrical equipment of two small Edison generators at the cable station, which are employed in the summer season, and are driven by belt from the cable flywheel. One of the

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OPERATION

Studies in Economic Practice:—St. Paul-Minneapolis.

By C. B. Fairchild.

First Paper.—Maintenance, Wages and Shop Practice.

In the theoretical consideration of any subject, undue weight is often given to some points and insufficient regard to others, so that the results secured in practice are often quite different from those which were originally anticipated. For this reason a study of the practice followed by street railway companies which have been operating cars for a number of years, with the results secured by them in pursuing certain methods, should be of help in determining the best policy to follow under other somewhat similar circumstances. The conditions presented by the system of the Twin City Rapid Transit Company are such as make a study of its practice particularly interesting. It not only provides urban transportation in the two cities of Minneapolis and St. Paul, which have a combined population of about 400,000, but also connects the business centers of the two cities by an interurban line, which is one of the most prominent factors in the financial life of the entire system.

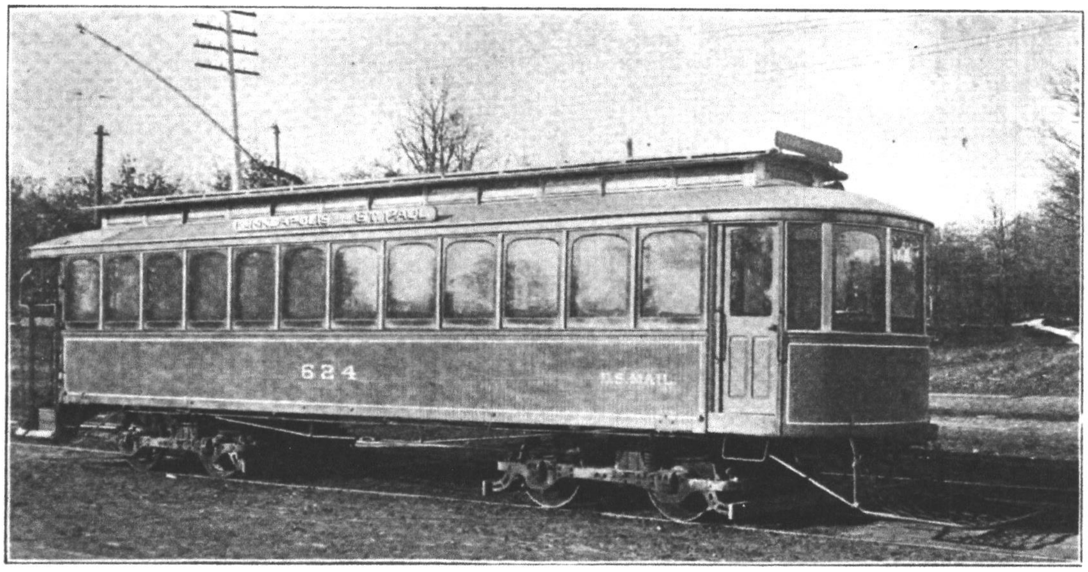

FIG. 1.—INTERURBAN CAR—TWIN CITY RAPID TRANSIT CO.

Thomas Lowry is president of the company, but the active management is entirely in the hands of C. G. Goodrich, vice-president, and his able assistants, among whom W. J. Hield bears the title of general manager.

The total street railway mileage in the system is 225, of which 6 are operated by cable power. The average number of cars in daily operation is 200, of which 45 are 44 ft. double truck cars, and are operated on the interurban line.

The following quotations from the president's annual report for 1895 will serve as a basis for a discussion of the practice of the operating department of the company: the gross passenger earnings for the year ending Dec. 31, 1895, were $1,964,772.65, a decrease of less than 1 per cent over 1894. The net earnings from operation were $1,009,319.

The proportion of total operating expenses to gross earnings for the entire year was 49.4 per cent and the cost of operation per car mile in 1895 was $.0819.

On the interurban line, where the cars make a run of 180 miles per day, the cost of operation to gross earnings during the last year was 33.15 per cent and the cost of operation per car mile (large cars) was $.1075.

A comparative statement of the cost of operation for the years named was as follows:

	1893.	1894.	1895.
General expense	$94,281.09	$61,162.07	$56,934.02
Maintenance of equipment	180,831.40	103,349.91	81,815.63
Maintenance of way and structure.	98,930.65	66,606.77	58,069.49
Conduct's' and motormen's wages.	452,686.83	369,597.97	378,256.49
Inspect's' and trans. agts'. wages.	27,252.32	14,300.28	8,859.13
Conducting transportation, misc.	144,517.62	90,638.92	87,131.08
Cost of maint'ing power stations.	229,357.67	161,374.85	154,103.73
Machine shop expense	36,550.37	22,999.99	21,722.24
	$1,264,407.95	$890,030.76	$846,891.81

The cost of maintenance of equipment is subdivided as follows:

	1893.	1894.	1895.
Repairs to motors	$105,021.08	$66,054.79	$48,527.45
Repairs to car bodies	75,810.32	37,295.12	33,288.18
	$180,831.40	$103,349.91	$81,815.63

The decrease in gross receipts over the year before was due to the prevailing business depression.

As far as can be observed, the large decrease in the operating expenses from year to year is legitimate, for the physical condition of the property appears to be first class.

A large reduction during the last two years has been secured in the salary account by the elimination of high priced heads of departments, including superintendent of repair shops, master mechanic, chief engineer, and electrical engineer. In place of the superintendent, a foreman is employed in the car shop at a moderate salary, who has a bench and does some of the finer work, such as pattern making, etc., while he oversees the other work.

In the body repair department twelve men are regularly employed, and each one is expected to operate the wood working tools, getting out such parts as his special work requires. The tools are operated from an electric motor so that they may be started and stopped at will. The equipment is kept thoroughly painted, the management believing that good and frequent painting is economical in the long run. In the paint shop there are thirteen men, only four of whom are termed skilled workmen. The others are young apprentices. In the iron shops a foreman is employed who supervises the iron working tools and lays out the work for the men. It is held that the shop work, which is largely of a routine nature, can be done by mechanics without specially close supervision.

The vice-president however makes it a point to visit the shops every morning, and so acquaints himself with the details of the work and the needs of the service.

The general manager visits the power station every morning, holding the engineers in charge responsible for the work, and so far has secured very gratifying results. Of course, due credit for the organization of the different departments is given to the men who have formerly held positions at the head of these departments.

MAINTENANCE OF EQUIPMENT.

Referring to the item of "Repairs of Motors," under "Maintenance of Equipment," it will be noted that the charge during 1893 was largely in excess of the other years. This was due to the fact that during this year the entire motor equipment was remodeled or rebuilt. This change, however, increased the efficiency of the motors, and largely reduced the cost of maintenance during the subsequent years. The company has 200 equipments of the Sprague double reduction motors, some S. R. G. and some W. P. motors. The remodeling lay in rewinding both armatures and fields after a plan suggested by long practice, and the substitution of large shafts with tapering fits for collars and commutators. In the W. P. 50 motors a second field coil which was placed in the lower part of the body or shell of the motor was added. A long hollow shaft was also substituted to bring the commutator outside of the case. These shafts are constructed from old axles, and are upset in the wheel press to provide a bulb or enlargement of the shaft. This swelling when bored out, allows of the leads being taken in through the shaft. They are then brought out at the end outside the bearing, where they are bent back and attached to the outer ends of the commutator bars. To prevent arcing between the brushes and yoke of brush holder, the forked ends of the yoke are enclosed entirely in a wooden block, by which means the formerly troublesome arcing has been almost entirely eliminated.

The motors have now all been so thoroughly made over that they are considered by the management to be fully as efficient as the more modern type of motors, and are said to require but little if any more repairs.

The reduced cost of labor and price of material aided largely in the reduction of expenses in 1895 over those of previous years.

MAINTENANCE OF WAY AND STRUCTURE.

Referring to the item "Maintenance of Way and Structures," the president's report says: "The decrease in this item is the result of our rail joint construction, begun in 1892, and continued vigorously through 1893. It was a special joint construction, put in our track where the traffic was the heaviest, and the results have been most satisfactory, lessening the expense not only of track, but also of rolling stock maintenance."

This joint which has been brought into prominence by the above paragraph is illustrated in Fig. 3, and is a home made affair. It is of three parts, a cast iron base six inches square and two malleable iron clamps three inches wide, but of an equal height, being relatively long enough to extend from the base to the under side of the head and tram of a girder rail. These clamps are so formed that the lower ends hook under the edge of an oval pedestal cast on the base. The clamps embrace the joint outside the regular splice bars, so that the ends of each rail meet above the middle of the clamps, which are held in place by a bolt through the foot of each part, the bolt passing under the base of the rail and occupying a channel formed in the pedestal.

The entire weight of the joint for a forty-five pound girder rail is sixteen pounds, and the cost including bolt and nuts is about fifty cents. In substituting these joints in tracks where three ties are employed under or near the joint with a stringer beneath them, the middle tie is removed and one of less thickness substituted, so that the base of the joint rests upon the middle tie.

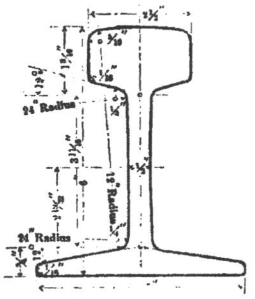

FIG. 2.—STANDARD RAIL.

Notwithstanding the excellent results had with these joints, they are not considered by the management as efficient as that of the Falk cast welded joint. A large number of the latter have been in service on some of the lines of this system for about a year, and have proven very satisfactory. Only a very few of them have broken during the past winter and the company has decided to employ this type of joint in repairs and renewal of joints on its city lines, a contract for a large number having been already closed.

The standard rail adopted for the city streets is an eighty pound T, of a modified design. The rail is six inches in height, with a five inch base, and the weight is distributed as follows:

Head,	43 per cent.
Web,	26 "
Base,	31 "
	100 "

Where asphalt paving, which is the prevailing paving in the city, is employed this rail is spiked directly to the ties. The latter are placed from three to four feet apart and are embedded in a concrete foundation, the concrete being tamped up solid to the base of the rail between the ties. In case different material is used for paving, the company has adopted the plan of using the same material between the rails as is employed on the sides of the street. This practice prevents in a measure wagon traffic seeking the tracks should the side paving become slippery.

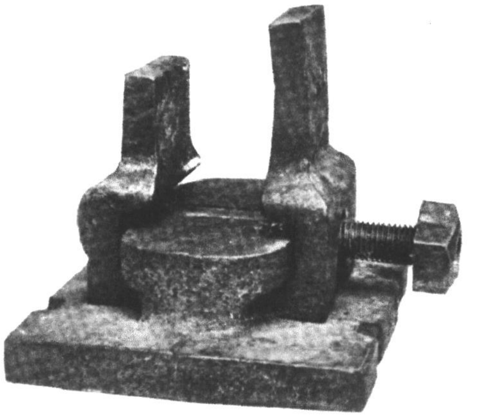

FIG. 3.—JOINT CONSTRUCTION.

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On the interurban line a fifty pound T rail, with fish-plates as in ordinary steam railway construction is used. There being no paving on this line, it is considered not practicable to employ a continuous rail, lest the effect of expansion and contraction be disastrous. At the only steam crossing of the interurban line the trolley cars use a single track only. This is a precautionary measure to prevent cars passing while crossing the steam tracks. The possible danger of one car obstructing the view of an approaching train, especially should the train after passing suddenly back up, is thus avoided.

The rails on the interurban line have now been in service a little more than six years, and are in a remarkably good condition, considering the service. In the opinion of the management, the heavy eight wheeled cars are not as hard on the rail joints as are the four wheeled cars, for it appears that the interurban track has stood up better than any portion of the system. With proper care the rails would seem to be good for ten years' additional service.

In this connection, it may be stated that the interurban cars are forty-four feet in length over all, and are mounted on double trucks, with thirty-three inch wheels, the leading wheel in each truck being of the steel tire type. The cars weigh empty 30,500 lbs., and are estimated to weigh with one hundred passengers, 43,600 lbs. The eighteen foot cars employed on the other sections of the system weigh from 14,000 to 15,000 lbs.

In the city of Minneapolis, center pole construction prevails, and to provide an elastic hanger for the trolley wire, a balance bar has been substituted in place of the rigid hangers formerly employed, at which the trolley wheel sparked badly in passing. The device, illustrated in Fig. 4, consists of a block of wood 12 ins. long by 1¼ ins. square. It has a hanger at each end which embraces the trolley wire and is attached to the pole by means of a clevis. Cotter pins placed each side of the support allow of a slight end movement to the clevis. On the approach of the trolley wheel, the receiving end of the support tilts up slightly and so provides an elastic passage for the wheel. This construction is said to have resulted in a large saving in trolley wheel renewal and hangers.

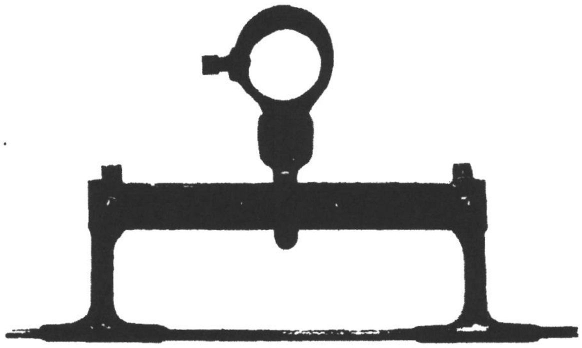
FIG. 4.—HANGER FOR BRACKET POLES.

CONDUCTORS' AND MOTORMEN'S WAGES.

The saving in "Conductors' and Motormen's Wages" was effected by a reduction in hourly payment. The rates now paid are sixteen cents an hour, except on the cable and interurban lines, on which the car men receive seventeen cents per hour. In this connection it may be stated that the company aims to secure as motormen on the interurban cars men weighing not less than 170 lbs.

INSPECTORS AND TRANSFER AGENTS.

The striking reduction over that of 1894 in this item of expense ($5400) was due to a change in the method of issuing transfers. Formerly agents were employed at central points whose duty it was to issue transfers to such passengers as wished to continue on other lines. This gave rise to a good deal of dissatisfaction, as frequently the passenger would be obliged to pass his desired point of transfer to secure a ticket, when he would have to walk back or move to another point. The management reasoned that it is always better to accommodate the public in all reasonable directions, and for this reason the agent system was abolished and transfers were put into the hands of the conductors to be issued at all connecting points. The change has resulted in the above saving and the number of transfers has not materially increased.

The conductors in receiving transfers ring them up the same as fares, and on their runs turn in their transfers each trip to an agent stationed on the street near the center of the loop. The cash fares are turned in only once a day. The orders require that transfers be rung up for the reason that it is much easier for inspectors to check up a car where all receipts are rung up than it is where an exception is made in case of transfer tickets.

The transfers on one or more of the lines are checked up every day in turn, to see if there is any abuse on the part of employes. So far, very little abuse has been detected, either on the part of the public or employes. This condition of affairs is doubtless due to the very close inspection instituted by the management.

In addition to accommodating the public in the matter of transfers, more attention than formerly is given to the accommodation of passengers in other directions, especially in providing more seating room and wider and more comfortable seats, and by keeping the cars up in the best shape possible, making them more attractive and pleasant. During the morning and evening hours on such days as the traffic is unusually large, trailers are employed, it being held that a conductor can better work two cars that are not crowded than one overcrowded.

Special attention is given to increasing the twelve o'clock dinner hour traffic by providing plenty of seating room and other accommodations so that merchants and others can conveniently and comfortably reach their homes for dinner.

REPAIR SHOPS.

The machine shop of the company is equipped with an unusually fine assortment of iron working tools, among which are two milling machines for gear and pinion cutting. The company thinks however of abandoning the practice of cutting its own pinions, but will continue to cut gears as formerly. There is also a very large lathe which may be employed for turning down the treads of flat wheels. In this operation a pair of wheels with axle is centered in the lathe. The tread is then caused to revolve in an opposite direction to an emery wheel which is driven very rapidly from the main shaft. The emery wheel is encased with a galvanized iron covering, and the wheel revolves in a galvanized iron vat containing water. The practice of grinding flat wheels is considered an advantage, but the same set of wheels is only ground down once.

Among the other useful machines employed is a magnetic separator for separating the steel and copper chips and filing. This is a small machine, with a magnetic cylinder, above which is a receiving hopper into which the turnings are poured. The valuable non-magnetic metals pass over a cylinder and fall into a receptacle, while the magnetic metals are carried further round and are brushed off into a separate receptacle by a revolving brush.

Railed off from the main shop is a tool room in which all the small tools are kept. These are checked out and in, as is the custom with large manufacturing establishments.

The company makes its own brass and bronze castings and trimmings, and for this purpose has a very good brass foundry, with modern equipment. It is estimated that the metals are remelted and put into useful product at a cost of about three cents per pound. Trolley wheels, cast bonds and trimmings of nearly every description are manufactured. The mixture for trolley wheels and some other castings is one part of tin and nine ounces of zinc to seven pounds of copper. There is also a bronzing and burnishing department in which car trimmings are cleaned, with all the usual appliances of a manufacturing establishment.

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The power for operating the shop machinery is supplied by a seventy-five horse power bipolar motor. Provision is made for testing all repair motors, and numerous labor saving appliances are observed about the shop. It is also notable that the floors are kept in an exceptionally clean condition.

As a general thing the cars are taken into the shops every two weeks for inspection and such repairs on motors and trucks as may be necessary. In cleaning dismounted motors after the armature is removed, the fields are immersed by means of a trolley hoist in a large tank containing a hot solution of washing soda, which removes all grease and dirt and materially facilitates the cleaning of the motors.

The portion of the shop into which the cars are run for motor and truck repairs was formerly a roundhouse for the repair of the dummy engines employed on the suburban lines. The cars are placed in the different stalls of the roundhouse by means of an outside turntable, which is considered by the management a very convenient method of shifting cars in and about the shops.

Not including the trainmen and office employes there are regularly employed in the mechanical departments, including switchmen and curvemen, 125 men, distributed as follows:

12	men in wood working shops.
13	" " paint shop.
23	" " machine shop proper.
6	" " blacksmith shop proper.
4	" " brass foundry.
14	" " armature room.
23	" " motor repairs.
2	" " steam fitters, draughting room and stores.
28	" " miscellaneous.

The large store rooms in connection with the shops were fully described in the STREET RAILWAY JOURNAL for February, 1893, and are managed about as stated there.

In making out a requisition for supplies, the foreman, or whoever makes the original order, sends same direct to the storekeeper and purchasing agent, who attaches a slip to the requisition, showing the cost of the article or articles, so that when the manager passes upon the requisition he is able to judge of the cost as well as the quantity. When the bill for the goods is received the same slip is attached to it, so that in approving the bill the manager can judge how near the estimate was made to the actual cost. By this practice the foremen of the different departments are taught to be conservative in making their requisitions, as frequently they might order a quantity of goods without regard to the cost. The practice also relieves the manager from a certain amount of guess work in auditing the orders.

The subject of accidents is one to which the company has given close attention, and the means adopted for prevention of casualties are so valuable and interesting that their description will form the subject of a separate article.

Wheel Notes.

THE hardness of the chilled tread is usually tested by a file or a sharp cold chisel and a hand hammer. Ultimately, some more certain and better means may be devised. Experiments have been made with emery blocks noting the time required for cutting through to the soft metal, but the apparatus is not in general use.

IN a recent letter a car wheel maker complains bitterly of the extremely low price of wheels at present, due to the competition of unscrupulous manufacturers, and says that in many of the car wheel works in the country "at least seventy-five per cent of the material used is made up of No. 3 mill or gray forge iron and the cheapest description of scrap, including malleable iron, plow points, burnt grate bars, etc., the whole going into the cupola accompanied by a certain proportion of ferro-manganese to add strength and chilling qualities to the mixture. The ferro-managnese, of course, fulfills its purpose in a measure, although the very small proportion added is not likely to become uniformly distributed throughout all the material."

A Study of the Causes Which Lead to Breakage of Gears and Pinions.

By CHARLES F. UEBELACKER.

Second Paper.—Methods of Testing.

Of the four conditions to be met in practice by motor gears and pinions, viz., new gear against new pinion, new gear against old pinion, old gear against new pinion, and old gear against old pinion, the first was discussed in the last issue of the STREET RAILWAY JOURNAL. Of the three remaining, the most severe likely to occur in good practice would be that of a new pinion not very well cut, applied to an old gear, say, one whose teeth had worn down to about .125 in. at *a*, Fig. 1.

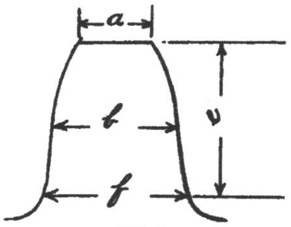

FIG. 1.

Theoretically the teeth should wear off evenly over the entire depth of their working face, so that if our tooth which originally measured .271 in. at *a*, Fig. 1, now measures .125 in., it should now measure at *f* .395 in. instead of .591 in. as in the new gear. In actual practice this is not the case. The play in the bearings permits more or less movement of the centers and the result is a wear as shown in Fig. 2, which is a reproduction of a template of a partly worn gear. At *a* in Fig. 2 can be seen a decided ridge which marks the lowest point of the worn surface. Clearly the dimension of *f*, Fig. 1, has been reduced scarcely at all, and the worn tooth shown in Fig. 2, although reduced at the top from. 271 in. to .186 in., has scarcely suffered at all in strength. Farther wear of this same gear until the dimension *a*, Fig. 1, should be .125 in. would probably result in the other dimensions being altered to

$a = .125$ in.
$b = .377$ in.
$f = .356$ in.
$e = .445$ in.

Assuming the same conditions as for the new gear and substituting in the equation given last month we get

$$P = \frac{29370.}{.017} \times .178 = 29,600 \text{ lbs. per sq. in.},$$

or the strain in the portion of the section which has suffered reduction by wear is increased about fifty per cent as compared to new teeth, or if our metal (as stated above) has a breaking strain of 60,000 lbs. per square inch, we would still have a factor of safety of 2 in the extreme conditions secured.

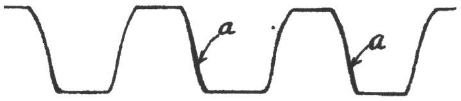

FIG 2.

Having then determined the strength which teeth should show, a simple test is desirable by which we may determine approximately whether any sample gear will fulfill the conditions. The wheel press offers us facilities for such a test, and very few roads are so placed that a press is not accessible.

Fig. 3 gives diagrammatic view of the arrangement of such a test. Here *f* is the yoke and *e* the plunger of the press. The half gear *b* has been securely strapped to the yoke *f*, and the third tooth *c* from the split has been shaped or chipped down so as to permit the flat bar *a* to be forced against the second tooth *g* at about the pitch line, a slip of metal *d* holds the point of the bar *a* in place and insures its striking the tooth at the proper height.

The wheel press can now be pumped up until the pressure begins to show on the gauge. The belt can then be thrown over on to the loose pulley and the flywheel turned by hand slowly enough so that the operator can

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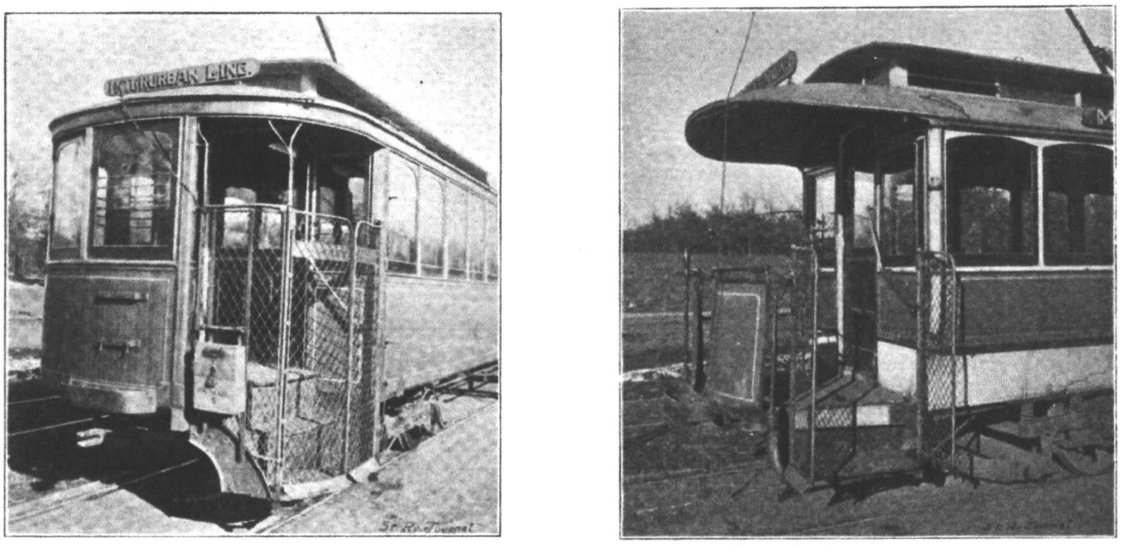
OPERATION

Studies in Economic Practice: St. Paul-Minneapolis.

By C. B. Fairchild.

Second Paper—Rolling Stock, Accidents and Accident Blanks.

The laws of the State of Minnesota compel the use of vestibules on all cars during the winter months. This requirement was not opposed by the Twin City Railway Company, and is regarded as necessary in this climate. The vestibules have double windows, which prevent the formation of frost on the glass, so that the motorman's vision is not interfered with, as with single glass vestibules. The vestibules are also considered an advantage for the reason that the motorman does not have to muffle his hands and face so thoroughly in cold weather as he would be obliged to do on an open platform. This leaves him more free to operate his controller and brake handle, and it has not been observed that collision accidents have been any more numerous since the vestibule was adopted than formerly. In fact, it is said they have been lessened, owing to additional care exercised on the part of the motorman. The vestibules on the open grip cars are diamond-shaped enclosures in the middle of the car and have glass on all sides above the back of the seats, with a narrow door at the rear end.



PLATFORM GATE, OPEN AND CLOSED—INTERURBAN LINE.

It is estimated that the cost for heating the cars on the entire system is about $30 per day. Ordinary coal stoves are employed on the city lines in both St. Paul and Minneapolis. The interurban cars are heated with the Baker heater. These heaters are left in the cars throughout the season. They are so placed as to warm the vestibule as well as the interior of the cars, so that the motorman is not required to wear an overcoat even in cold weather.

The distance between the two cities is about ten miles, and the trips are made in about fifty minutes, with a headway of five minutes.

The practice of placing the rheostat against the dash or at the side of the platform on the cars, described in the Street Railway Journal for February, 1893, is still followed. The case enclosing the rheostat, which is of the old style semi-circular type, also contains the fuse boxes and cut-out switches. A modification however has been made in the connections, so that on the first few points the motors are coupled in series. After that, the multiple series is used as formerly.

In refitting the open cars for the coming season, the long cars are being strengthened by the addition of a truss rod an inch in diameter. This is anchored at each end and passes over pedestals nearly as high as the seats, adding largely to the strength of the car. At the same time the cross bolts have been enlarged and the side sills reinforced by a steel plate. The cross seats also of the open cars have been widened by lengthening the back supports, so that the seats are two inches wider than formerly. This does not take up any more room than formerly in the car, and has proven more restful and acceptable to the passengers. The open cars are being fitted with gates, and are being enclosed oneach side by wire screens, so that passengers can only enter or leave by the rear platforms.

A number of the open cars have been lengthened by cutting them in two and filling in the middle part with new construction. Hoods have been lengthened and supported by pipe posts from the platform. In some cases hard wood

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is being employed for car floors, on the supposition that it will wear longer and be smoother and more agreeable to the passengers.

The cars of the entire system are painted of the same color. That employed for the sills, truck, and fenders of open cars is an olive brown with a lemon yellow for the posts and upper part, giving a solid appearance to the car.

The colors for painting the open cars are compounded as follows:

PANEL COLOR.	
10 lbs.	Lead in oil.
1 "	Lemon chrome in oil.
½ "	Golden ochre in oil.
5/16 "	Japan.
	Turp.

SILL COLOR.	
5 lbs.	Golden ochre.
1/16 "	Prussian blue.
1 "	Indian red.
1 "	White lead.

The brake mechanism on all the cars is operated by means of a horizontal hand wheel, instead of a ratchet handle. It is claimed for this arrangement that the motorman is often able to use both hands in applying the brake, and so can exert greater power than where a handle is employed, and that he can get a greater accuracy of adjustment than with the other method.

A new electric headlight has recently been designed in the company's shops. It is about a foot in diameter, with the ordinary reflector, but the socket for the incandescent lamp is at the apex of the cone, so that the bulb is held in a horizontal position.

Among the labor saving devices noted about the stations is a car jack, which is designed and manufactured in the shops of the company. It is of the ratchet screw type, and has a circular iron base, with a tripod supporting the nut. The top of the screw has a loose collar, and the ratchet is arranged above the screw. A tilting catch operates the ratchet and is contained in the horizontal hollow handle. A wooden handle of suitable length is used for operating the screw, which has a moderate pitch. By the use of a jack on each side of the heaviest cars, the ends are easily elevated for the removal of trucks or for their repair.

Another feature of this jack is the facility by which it may be moved about, as it has only to be tilted upon its circular base, when by taking hold of the collar and handle, it may be rolled or wheeled about the house.

The company has about twenty snow plows of the pilot type, but no sweepers. One of the plows is a large conveyor plow, modeled after those employed on steam lines. The pilot is an endless chain with buckets which lift the snow and carry it back to a cross conveyor by which it is dumped to the side of the track. There is also a very heavy steel plate wing operated from derricks by a motor for pushing the accumulated snow away from the tracks. The plow is operated by five motors, and has proved efficient in heavy drifts. The past winter however has been remarkably free from snow storms, and there has been very little use for the plows.

ACCIDENTS.

The table on this page gives a comparative statement of accidents reported for the months of January and February, 1895 and 1896.

CLASS OF ACCIDENT.	January, 1895.				January, 1896.				February, 1895.				February, 1896,			
	Minneapolis.	St. Paul.	Interurban.	Total.	Minneapolis.	St. Paul.	Interurban.	Total.	Minneapolis.	St. Paul.	Interurban.	Total.	Minneapolis.	St. Paul.	Interurban.	Total.
Boarding moving cars	28	10	6	44	3	2	1	6	20	5	1	26	2	2	..	4
Cars starting—alighting or boarding	3	1	1	5	1	1	..	2	2	2	..	4	2	..	..	2
Cars off track	6	2	2	10	7	2	2	11	3	1	..	4	8	1	1	10
Collision of cars	13	3	2	18	8	3	1	12	4	7	..	11	8	6	1	15
Collision of cars with persons	3	4	2	9	6	4	1	11	6	6	1	13	1	1	..	2
Collision of cars with vehicles	37	29	3	69	29	27	6	62	29	20	9	58	24	13	9	46
Collision of cars with animals	1	7	1	9	2	1	..	3	2	3	1	6	5	..	..	5
Cable slot injury	..	3	..	3	..	2	..	2	..	8	..	8	..	1	..	1
Center pole injury	2	..	1	3	1	..	..	1	1	..	..	1	..	..	..	..
Disturbance on cars	..	..	..	..	..	..	1	1	2	..	..	2	..	..	..	..
Disorderly conduct	5	1	..	6	1	..	..	1	2	..	4	6	2	..	2	4
Employes injured while on duty	8	8	1	17	10	3	1	14	15	4	2	21	8	..	..	8
Electric shock to persons	..	1	..	1	1	..	..	1	..	..	..	..	1	..	..	1
Electric shock to animals	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ejectment from cars	..	..	2	2	..	..	..	..	..	1	..	1	..	..	..	..
Fell off cars on curves	1	..	..	1	..	..	..	..	1	..	..	1	..	..	..	..
Fell—alighting or boarding	20	2	5	27	10	6	4	20	10	6	2	18	5	1	..	6
Fell in, on or off cars	4	3	1	8	3	1	..	4	1	1	..	2	..	1	..	1
Frightened horses	17	5	2	24	6	6	..	12	11	3	4	18	7	4	3	14
Injury to company's property	2	1	..	3	3	..	1	4	4	..	..	4	1	..	..	1
Left moving car	34	26	11	71	3	6	1	10	25	22	2	49	8	8	..	16
Trouble, account fare	..	..	2	2	..	..	..	..	..	..	2	2	1	..	..	1
Transfer trouble	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..
Trouble, account change	1	1	..	2	1	..	..	1	..	..	..	..	..	..	2	2
Miscellaneous	19	11	5	35	17	8	7	32	25	14	4	43	11	4	1	16
Gate injury	..	..	..	..	3	..	1	4	..	..	..	..	4	1	..	5
Bicycle account	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	2
Total	204	118	48	370	115	72	27	214	163	103	32	298	99	43	20	162

The figures show the following per cent of decrease in 1896 over 1895:

	Jan.	Feb.
Minneapolis division	43.63	39.26
St. Paul division	38.98	58.25
Interurban	43.75	37.50
Average	42.16	45.64

From this table it will be noted that there was an enormous reduction (viz., from 44 to 6) in the total accidents under the first item "Boarding Moving Cars." This is accounted for chiefly by the employment of safety gates (page 346) on all cars.

The gates are on the rear platforms of single ended cars, and on the diagonal platforms of double enders. They are of two-leafed wire, open outward from the center and have a framework of gas pipe with interlacing wire.

Each gate is hinged above the lower step and is operated from the front platform by bell cranks and a crank lever. It is thus entirely under the control of the motorman. This gate prevents the egress and ingress of passengers while the car is moving. As soon as the car comes to a

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full stop, the motorman opens the gates, and after getting the signal he closes them before starting, so that there is no possibility of persons attempting to board the car after it is once in motion.

This relieves the motorman of a great deal of anxiety, as he ordinarily would be continually looking back before starting to see if the rear platform was clear. The cranks and levers are so arranged that when the gate is fully open or closed it is locked in position and cannot be moved, except by the handle in the motorman's cab. Since their adoption, these gates have proven very acceptable, both to the patrons and management. The few accidents noted under the head of "Boarding Moving Cars" have been almost entirely on the trailers, a few of which are run during the busy hours without gates. These gates were designed and manufactured in the company's shops, and are attached at a reasonable cost. On the interurban line a more elaborate gate is provided.

In experimenting for the best form of gate different types were tried. The first included a folding step, but this interfered with people standing on the platform, and so was not satisfactory. The second was a lifting lattice gate, but it closed against the people standing on the platform and was finally discarded for the double gate illustrated. In elaborating more fully the advantages found in the use of platform gates, it may be stated that the first car was equipped Nov. 20, 1894, and after being run for some time as an experiment, the remaining cars in both cities were equipped, the work being completed by Apr. 15, 1895.

The class of accidents which are eliminated by the use of gates are as follows: boarding moving cars, leaving moving cars, cars starting while alighting or boarding. Since the equipment of the cars, this class of accidents has shown a steady decrease in number from those of the corresponding months of previous years. Commencing with March, 1895, and ending with February, 1896, as compared with the same periods during the years 1894 and 1895, the decrease in the number of accidents was 1319, or 34 per cent. Since the gates were placed upon the cars however a new class of accidents, classified as gate injuries, has developed, and during the period noted above, March, 1895, to February, 1896, there were reported from all divisions, including the interurban, 132 of this class of accidents. With one or two exceptions, however, these accidents were of a trivial nature, due to the unfamiliarity of the public with the gates. The few serious accidents with them were due to early faulty construction and were caused by the catching of ladies' dresses in the guard at the bottom of the gate. The guards have since been removed and the only dangerous feature from the gate has thus been eliminated. With the exception of the three accidents mentioned, the gate accidents have cost less than $1000, while it is estimated that they have saved in actual cash disbursement for 1895 at least $30,000 and a contingent liability that might possibly develop into payment of many thousands more. The above class of accidents have been favorite ones for contingent fee lawyers to work against the company.

It is also noticed that as the gates when open, stand out from the car, they compel persons passing behind or leaving the car to step out at a little distance from the rear platform and they are thus prevented from stepping before an approaching car on the other track. In one case when a car was on a down grade, the trolley wire broke and caught in the trolley base. This caused an arc which created a panic and tended to stampede the passengers. They rushed to the rear platform, but the conductor by the aid of the gate was able to prevent any one from jumping from the car.

With these gates, other precautionary measures have been employed to prevent accidents, notably a wider step than formerly used. The standard foot rest of the steps is now fourteen inches and the ends of the platform floor boards are left flush with the supporting sills. This avoids the liability of passengers tripping while boarding the car, and the wide step provides a surer footing than a narrower one would. With the latter, passengers frequently lost their balance and pitched forward, from carelessness in placing their foot too far over the edge of the step.

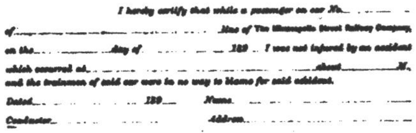
Other factors besides the above have also entered into the reduction of accidents, notably, a better class of car employes, the adoption of a more thorough and continuous system of instruction as to their duties, the impressing upon them the necessity of care and watchfulness, and a ceaseless system of inspection.

Accidents have been somewhat lessened too by the adoption of fenders on all the cars. The fender used is known as the Buffalo type, and consists of a pipe frame, with rope netting. This fender however is mounted on the cars of the Twin City system in such a manner as to be dropped down by foot attachment when approaching a fallen body.

ACCIDENT BLANKS.

The claim or accident work of this company is conducted in a very orderly and scientific manner, and the methods have resulted in a great saving of accident expense, both in preventing and in settling of accident claims.

When an accident occurs on a car the conductor at once passes blank cards, similar to that shown in form 1, to such persons as may have witnessed the accident, and also obtains the name of the injured person, getting his signature to form 1, if possible. He then telephones the general office as quickly as possible. Witnesses are asked to write their own names and addresses when the collector collects them. This avoids the possibility of misspelling the names.



The Minneapolis Street Railway Company:

*I hereby certify that while a passenger on car No.*__________

*of*____________________*line of The Minneapolis Street Railway Company,*

*on the*__________*day of*__________*189*__ *I was not injured by an accident*

*which occurred at*__________________*about*________*M.,*

and the trainmen of said car were in no way to blame for said accident.

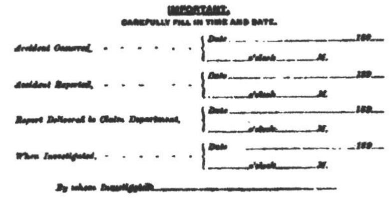
*Dated*__________*189*__ *Name*______________

*Conductor*____________ *Address*______________

FORM 1.

If the accident is of a serious nature, some member of the claim department hastens to the place in answer to a telephone message to secure evidence, attend to the injured, etc., and also makes a map of the location, showing the tracks, position of cars and such other memoranda as may be necessary. The train crews are relieved and called to the claim office as soon as possible to make out full reports.

In ordinary cases, however, where the accident is not of too serious a nature, the conductor writes out a report of the accident as soon as relieved at the station and sends it to the office with the witness cards. The blank used contains the following instructions:



IMPORTANT.

CAREFULLY FILL IN TIME AND DATE.

Accident Occurred, ... { *Date*______________*189*__ / ______*o'clock*______*M.*

Accident Reported, ... { *Date*______________*189*__ / ______*o'clock*______*M.*

Report Delivered to Claim Department, { *Date*______________*189*__ / ______*o'clock*______*M.*

When Investigated, ... { *Date*______________*189*__ / ______*o'clock*______*M.*

*By whom Investigated*____________________

FORM 2.

> Whenever an accident occurs, however slight, to any person or property either on or near the car or to the property of the company, you will at once stop your car and obtain *all* the facts connected therewith, the names of all witnesses (both on and off the car) and their residences. If persons are injured, obtain their names and addresses in full. You will then immediately report the case to the foreman, and fill out the following report, stating minutely every particular connected therewith, and hand the same into the foreman's office.
>
> When any person is ejected from a car for any cause whatsoever, all quarrels, disputes, etc. (which occur on the cars), must be reported on these blanks with names and residences of witnesses.
>
> N. B.—Any violation or neglect of this rule will result in immediate dismissal.

The form contains room for filling out number of car, time of accident, names of conductor and driver, place where accident happened, damage to car, names and addresses of persons injured, names and addresses of witnesses, etc. On the back of the report is printed the form for memoranda shown in form 2.

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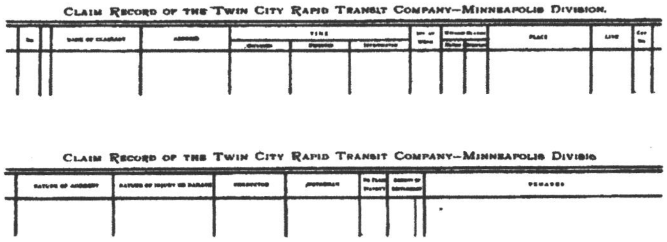
As soon as this report is received a clerk registers the time of its arrival. It is then carefully read by the chief and assigned to some member or members of the department with notations, "W. B.," which indicates that witness blanks should be sent out, or "W. B. Emps: & per Inv." Three exact copies are then made on the typewriter, witnesses' names being inserted. The report is then given a number, by which it is afterwards filed and known.


CLAIM RECORD OF THE TWIN CITY RAPID TRANSIT COMPANY—MINNEAPOLIS DIVISION.

CLAIM RECORD OF THE TWIN CITY RAPID TRANSIT COMPANY—MINNEAPOLIS DIVISIO

FORM 3.

From the original typewritten copy a letter press copy is taken, and this original copy is passed to the file, and a second one goes to the superintendent, and one to the claim clerk to whom the case has been assigned. At the bottom of each copy the name of the class or kind of accident is recorded, and such classification is always kept after having been so made. The original copy is used for sending witness blanks in case it bears the notation "W. B.," and when such blanks are mailed (with return envelopes) the fact is recorded in ink on the face of the copy. The original copy is also used for entering the case in the record book, which gives a few points of the case—for instance, the name and address of the claimant, time, place, line, car, classification, names of trainmen, memoranda, as shown in form 3.

The original copy is then attached to a file cover and put in its proper place in the file box, the case having been entered in an index under the name of the claimant if known. A calendar index is also kept which shows records under the dates of their occurrence. All of the blanks are of the same width. It provides for the case of——*vs.* Minneapolis Street Railway Company, amount of claim, name of attorney and other memoranda. The blanks in their order are fastened to the cover by a paper clamp and the filling boxes being of the same size as the cover, the papers are placed in without folding.

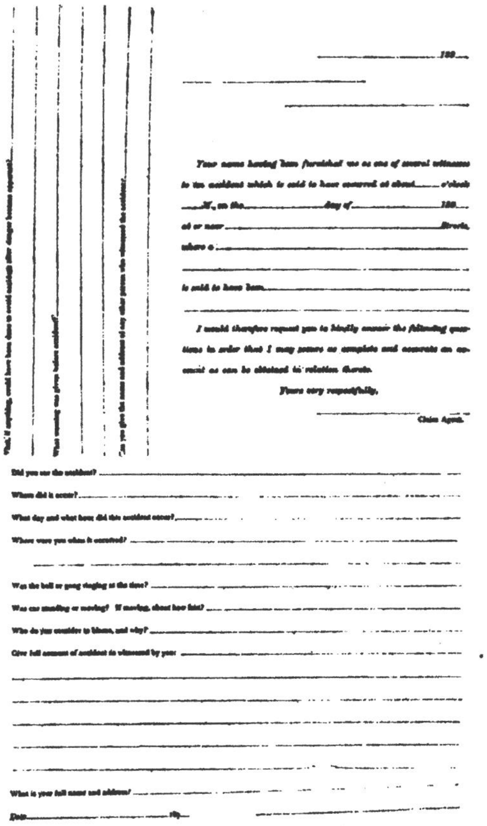
Before the original conductor's report is filed, it is carefully checked over by some member of the claim department and a criticism, if any, is noted on the back of the report, which is then sent to the superintendent, who has the matter investigated. The criticisms have reference to whether an insufficient number of witnesses are obtained, with no excuse on the part of the conductor, as the rules provide that the names of five witnesses in all cases if possible should be secured. Other points are "late report," "report not clear," "not signed," or other omissions.

An index with the names of all trainmen is also kept, and opposite each name is the number of the accident reports on which the name of the person appears. The object of this index is the ready reference in informing the operating department as to the necessity of keeping certain trainmen in the company's employ, in case there is reason for their discharge, as it is sometimes of advantage to retain a man who may be an important witness. When a trainman receives a time check, he is obliged to have it O. K.d at the claim office, to see if there is any important accident case charged against him, or whether he will be a valuable witness. In case he leaves the service, his address is entered in the same book, and a watch is kept on him so that he can be found when necessary.

The claim clerk, to whom the second copy has been assigned for investigation, secures statements from the witnesses (forms 4 and 5) calling upon them personally or awaiting answers by mail, according to circumstances. As the information is received a notation is made opposite the witness's name or otherwise as to the value of the witness, whether good, bad, in favor of the company or not. The investigation being finished, the copy with all files is handed to the head of the claim department who passes upon it, making a decision or disposition of the same. The copy is then checked off in the record books and is filed. In serious cases the statement of every witness and physician and all other evidence possible to secure is obtained. The physician's report is made on form 6.

Members of the claim department to whom cases are assigned make typewritten reports in full of their work, showing the circumstances under which witnesses were interviewed, claimants visited, affidavits or releases taken, etc. In many cases the injured parties are called upon and often "no claim" statements secured from them. These statements recite that the injury was not serious and that the company in their opinion was not to blame, often giving reasons for same. In visiting persons that are not supposed to be seriously injured, care is had not to excite their cupidity so as to make them feel that possibly they have got a claim and so refuse to settle, until they shall have consulted legal advice.

If the injured person insists upon damages, an affidavit is taken in which the claimant is requested to state fully the injury suffered and all of the damages desired. These affidavits are often of great importance in making settlements and are frequently used in court as contradicting the plaintiff's testimony. They are taken carefully with witnesses to the signature and are executed and sworn to before a notary, all the clerks in the claim department being notaries. Affidavits are generally written out by the claim clerk, but the claimant is made to understand and adopt the statements fully. Releases are also taken with the same care, witnesses to signature secured


______ 189__

______

______

Your name having been furnished me as one of several witnesses to the accident which is said to have occurred at about ____ o'clock ____M., on the ______ day of ______ 189__ at or near ______ Streets, where a ______ ______ is said to have been ______ ______.

I would therefore request you to kindly answer the following questions in order that I may secure as complete and accurate an account as can be obtained in relation thereto.

Yours very respectfully,

______ Claim Agent.

What, if anything, could have been done to avoid [illegible] after danger became apparent?

What warning was given before accident?

Can you give the name and address of any other person who witnessed the accident?

Did you see the accident? ______

Where did it occur? ______

What day and what hour did this accident occur? ______

Where were you when it occurred? ______

Was the bell or gong ringing at the time? ______

Was car standing or moving? If moving, about how fast? ______

Who do you consider to blame, and why? ______

Give full account of accident as witnessed by you: ______

What is your full name and address? ______

Date ______ 189__ ______

FORM 4—FRONT AND BACK.

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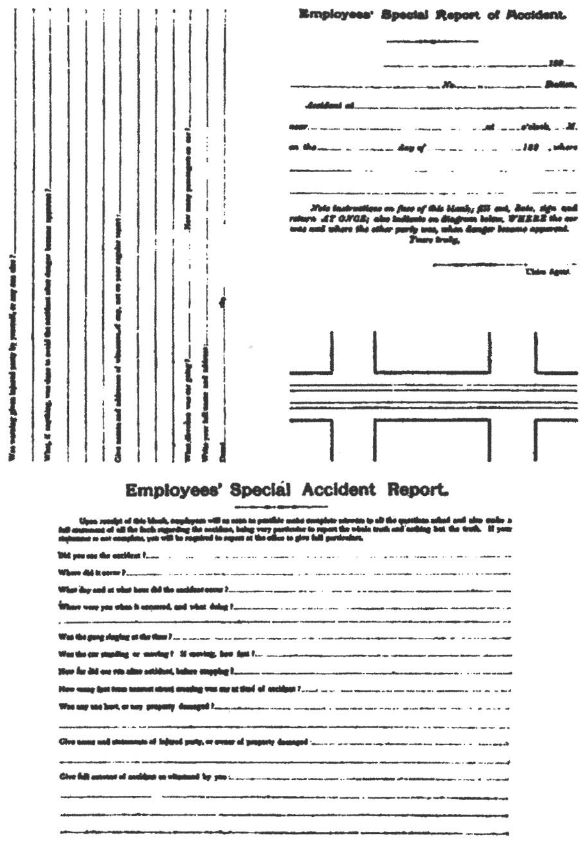
and acknowledgment taken. The signature of the injured person is also secured to a voucher as well as to a release and the payments are generally made by check.

The following is a copy of the release:

> I, , for and in consideration of the sum of dollars, lawful money of the United States of America, to in hand paid by the Minneapolis Street Railway Company, a corporation duly organized under and by virtue of the laws of Minnesota, have remised, released, and forever discharged, and by these presents do for heirs, executors and administrators, remise, release and forever discharge the said Minneapolis Street Railway Company, its successors and assigns of and from all causes of action, suits, controversies, trespasses, damages, judgments, executions, claims and demands whatsoever against the said Minneapolis Street Railway Company, which ever had, now have, or which heirs, executors or administrators, hereafter can, shall or may have, by reason of any matter or thing whatsoever, to the day of the date of these presents, and also by virtue of any claim or demand for damages by reason of an accident and injury to claimed to have been sustained on or about the day of A. D. Eighteen hundred and ninety (189).

Releases are copied in a letter book by press and are then turned over to the auditing department where the release is indexed and filed with the voucher. The amount of settlement is also handed to the bookkeeper.

All items of claim expense are entered on vouchers and in the auditing department are handled as follows: after being entered on the journal, each item is transferred to a ledger, in which a separate account is kept for each case, with heading so that each item is entered under its particular class. The headings are: Case Number; Class; Date of Accident; Line; Date of Payment; Explanation; Folio; Court Fees; Witness Fees and Mileage; Special Services; Briefs and Transcripts; Medical Expense; Physicians' Witness Fees; Incidentals; Amount of Release; Total Debits; Total Credits. Only the cases upon which expenses have been incurred are entered in this book and each account is held open for a short time after amount of release or paid judgment is entered. From this ledger monthly statements are drawn which show the classified expense of the department for a certain month, divided according to years in which accidents occurred, also showing expense for the year to date.



Employees' Special Report of Accident.

______ 189__

______ No. ______ Station.

Accident at ______

near ______ at ___ o'clock, __ M.

on the ______ day of ______ 189 , where

Note instructions on face of this blank; fill out, date, sign and return AT ONCE; also indicate on diagram below, WHERE the car was and where the other party was, when danger became apparent.

Yours truly,

______ Claim Agent.

Employees' Special Accident Report.

Upon receipt of this blank, employees will as soon as possible make complete answers to all the questions asked and also make a full statement of all the facts regarding the accident, being very particular to report the whole truth and nothing but the truth. If your statement is not complete, you will be required to report at the office to give full particulars.

Did you see the accident? ______

Where did it occur? ______

What day and at what hour did the accident occur? ______

Where were you when it occurred, and what doing? ______

Was the gong ringing at the time? ______

Was the car standing or moving? If moving, how fast? ______

How far did car run after accident, before stopping? ______

How many feet from nearest street crossing was car at time of accident? ______

Was any one hurt, or any property damaged? ______

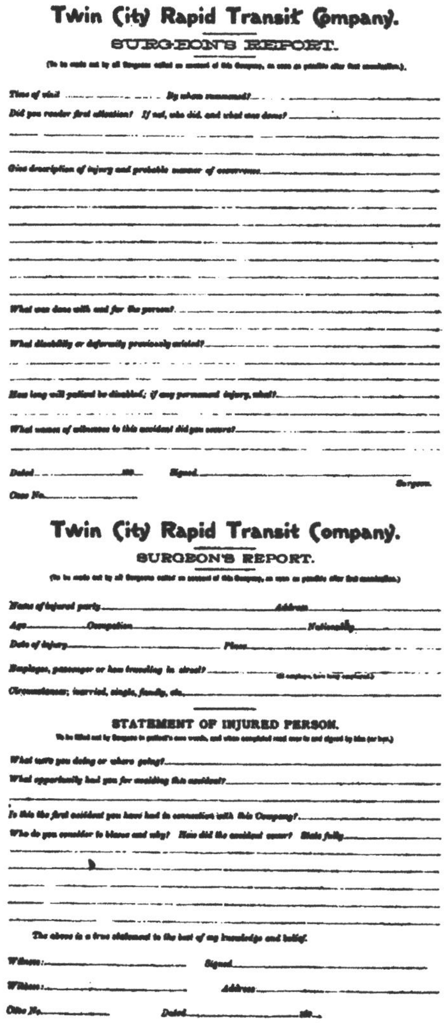
Give names and statements of injured party, or owner of property damaged ______

Give full account of accident as witnessed by you ______

FORM 5—FRONT AND BACK.

From the record book in the claim department a monthly statement is also made which shows the number of cases reported for investigation, compared with the same month for the previous year. These are classified as shown in form 7.

During the day and until late at night one or more members of the claim department is within call of the operating department, as often quick action is of great benefit in handling accident cases. In the claim department a book is also kept in which the names of such employes are recorded as are called into the claim office, with reasons why called, by whom called, when called, etc., and this entry is checked off after the employe has been sent back to his station. When sent back he is handed a slip for the foreman on which his name and the hour in which he left for his station are recorded, with instructions to return him to work unless otherwise directed by the superintendent.



Twin City Rapid Transit Company.

SURGEON'S REPORT.

(To be made out by all Surgeons called on account of this Company, as soon as possible after first examination.)

Time of visit ______ *By whom summoned?* ______

Did you render first attention? If not, who did, and what was done? ______

Give description of injury and probable manner of occurrence ______

What was done with and for the person? ______

What disability or deformity previously existed? ______

How long will patient be disabled; if any permanent injury, what? ______

What names of witnesses to this accident did you secure? ______

Dated ______ 189__ *Signed* ______ *Surgeon.*

Case No. ______

Twin City Rapid Transit Company.

SURGEON'S REPORT.

(To be made out by all Surgeons called on account of this Company, as soon as possible after first examination.)

Name of injured party ______ *Address* ______

Age ______ *Occupation* ______ *Nationality* ______

Date of injury ______ *Place* ______

Employe, passenger or how traveling in street? ______

Circumstances; married, single, family, etc. ______

STATEMENT OF INJURED PERSON.

What were you doing or where going? ______

What opportunity had you for avoiding this accident? ______

Is this the first accident you have had in connection with this Company? ______

Who do you consider to blame and why? How did the accident occur? State fully. ______

The above is a true statement to the best of my knowledge and belief.

Witness: ______ *Signed* ______

Witness: ______ *Address* ______

Case No. ______ *Dated* ______ 189__

FORM 6—FRONT AND BACK.

A note book with carbon paper is kept on the telephone desk on which the telephone messages of accidents are written. One copy is left in the book and one attached to the files of the case.

There is also a form filled out daily and sent to the superintendent which informs him of all releases taken during the preceding day. This information is of importance to him in the handling of his men.

As soon as an action is begun a file of the case is sent to the attorneys of the company, which they promptly review They return an outline of the case, in which appear the names and addresses of all witnesses, a brief memor-

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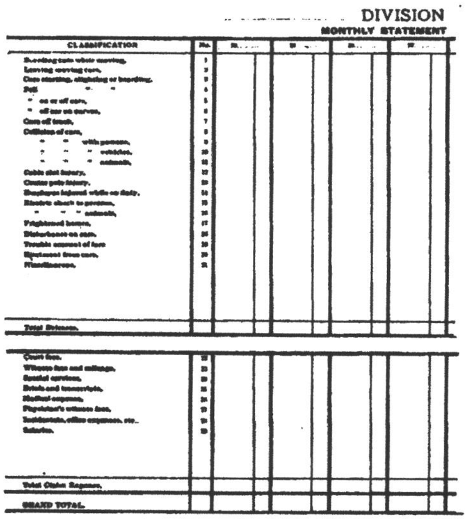
anda of the action and a request for such further information as may be wanted before trial.

Where maps and charts are made they are signed by the person for whom made, and when possible are attested by the claimant as to their correctness. There are other details of the work which are common to all claim departments. When once inaugurated the system described is not complex, is easily understood by the employes in the department, and the results so far have justified the care and methods employed.

OTHER OPERATING DEPARTMENT DETAILS.

In both cities the cars are run on loop systems, so that nearly all cars pass certain points. Upon the loop in the heart of each city there is a small house or octagon box. Here is stationed a starter who checks up the time of all cars, makes change for the conductors, acts as a general bureau of information to the public and telephones the office of any irregularity of service. The conductors on every trip deposit here their envelopes with their transfer fares and give brief information, often of great value, of any accident they may have had. Here, too, articles found on the cars are first left, and much other business transacted, so that the usefulness of these starters fully warrants the expense of their salaries. The checking up of the time card by the starters has a good effect upon the trainmen, causing them to use every effort to pass these points on time. In all delays of over five minutes, motormen are obliged to send in reports stating cause of delay, etc.

Every conductor is required to carry a trip sheet upon which full data are entered showing the time "up" and time "down," the fares received, and similar information. When relieved the conductors turn in these sheets at the different stations with the cash fares. Upon the following day these trip sheets are checked over by the mileage clerk and cashier, and then go to the operating department. In the latter place passenger records are kept, made up from the trip sheets, and showing plainly the travel upon the various lines during the preceding day.


DIVISION
MONTHLY STATEMENT
CLASSIFICATION
GRAND TOTAL.

FORM 7.

Adjoining the manager's office are two frames in which record cards and extra badges for conductors and motormen are kept. The frames are about 3 ft. × 6 ft. and have glass doors. The record cards, which are about two inches square and of manilla cardboard, are held in place by steel hooks which pass through holes punched in the corners. These cards are numbered as shown.

The cards are placed close together and cover the entire backs of the cases. In case an employe leaves the service, his card and name remain and a new card is prepared for the conductor who may have that number. In such a case the pin badge worn by the former employe is placed upon the hooks with his card where it remains until the badge is again used. The badges are numbered with a different hundred figure for the different stations, so that it is easy to select a badge that belongs to any particular station.

CONDUCTOR No.
O 153 O
Name,—ALBION JOHNSON.
East Side Station.
Appointed 1\10\'96.

The cards furnish a ready reference for the number and name of the employe, and correspond to the numbers kept in the record books.

There is also a car record board with double doors opening in the middle, in the manager's office. In this the assignment of the different cars at each station is shown. The numbers are painted on the tops of small plugs, the heads of which are about ¾ in. in diameter, while the spindle is only ¼ in. in diameter. These plugs are adjusted in holes in the back of the case and inside of the doors to correspond with the position of the cars, whether in the shops or at different stations. The record can thus be changed every day according to the car reports.

READY REFERENCE BOOK.

The president, vice-president and general manager are each provided with a ready reference book which is ruled and indexed, and contains a comparative statement of cost of operation, number of passengers, cost per car mile, and other details to which it is necessary for the manager frequently to refer. Each month these books are corrected to date in the accounting department, and are always kept handy or carried in the pocket for reference. By this means, when called upon, the officers are able to give definite information, avoiding guess work and are also able to compare the monthly results with those of corresponding months in previous years. The books have an alphabetical index and the headings are readily located and contain the following information:

List of equipments, description, when purchased, cost.
Comparative statements by months since organization of road of
Gross Passenger Earnings.
Gross Expenses.
Surplus Earnings.
Car Mileage.
Gross Earnings Per Car Mile Run.
Gross Expenses Per Car Mile Run.
Surplus Earnings Per Car Mile Run.
Per Cent of Operating to Gross Earnings.
Insurance.
Injuries and Damages.
Legal Expense.
Contingent Expense.
Interests on Bonds.
Interest on Floating Debt.
Taxes.
Net Earnings.
Average Passengers Carried Per Car Per Day.
Average Passengers Carried Transferred.
Average Transfers Collected Daily.

◆

A LARGE installation of individual electric motors has been made at the Illinois Steel Company's plant. About eighty motors ranging in size from three horse power to fifty horse power and aggregating 1500 h. p. of rated capacity have so far been put in position, the attachments being in most cases made directly and without the use of belts to the different machines. The generating plant consists of one 300 k. w. generator with two 126 k. w. generators as spare. The average load in the engine room runs at about 1200 amperes at a pressure of 240 volts, which is that used on the power circuits.

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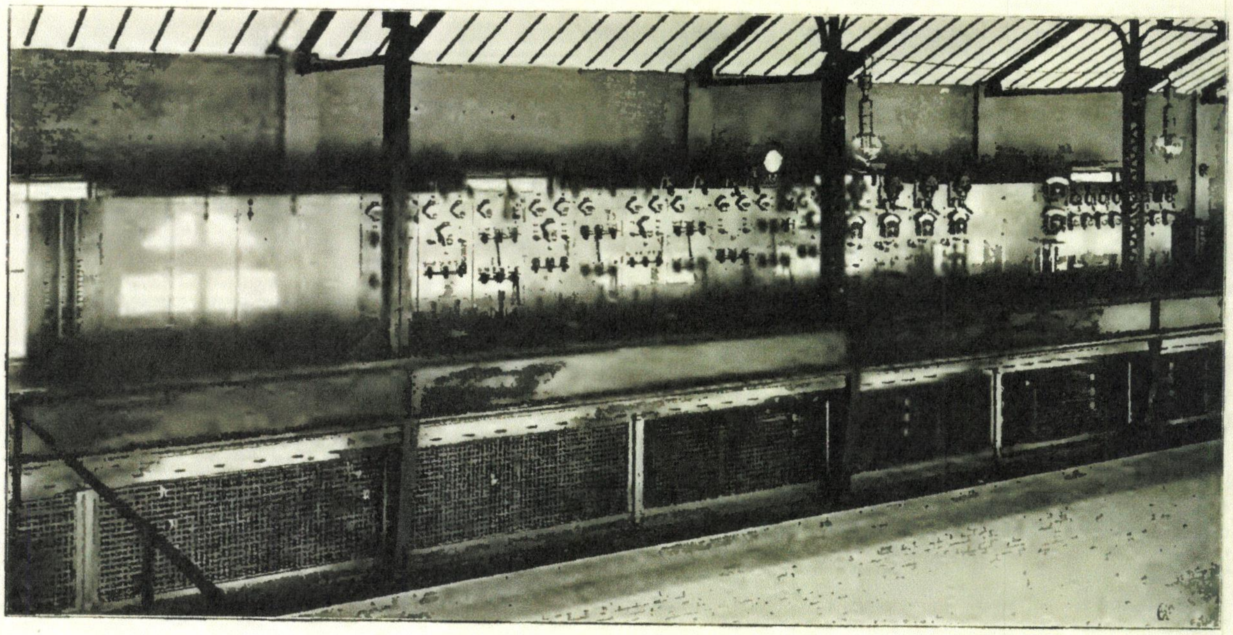
Power House and Shops of Twin City Rapid Transit Company.

Description of the Water Power Plant at St. Anthony's Falls—Method of Distributing Current—Changes Effected in Old Stations—Description of the General Shops of the Company and of the New Car Shops—Standard Double Truck Car for City Use—How Accidents Have Been Reduced by Gates and Fenders.

The Twin City Rapid Transit Company was chartered in June, 1891, under the laws of New Jersey, but the three companies which it controls, the Minneapolis Street Railway Company, the St. Paul City Railway Company, and the Minneapolis, Lyndale & Minnetonka Railway Company, are much older. The men who are now managing this company were interested in the street railways of the Twin Cities before the motive power was electricity and were pioneers in electrical working. Thomas Lowry, the president, was among the first to recognize the future of electricity in the street railway field, and though he had decided upon a cable system and purchased large quantities of material, did not hesitate to change his plans and use the newer power. C. G. Goodrich, the vice-president, has been connected with this system for over 20 years, and W. J. Hield, the general manager, for nearly 12 years. Both have been untiring in their efforts to develop the business, and the success achieved crowns the work. The auditor of the company, John F. Calderwood, is well known to the street railway men of the country through his connection with the Street Railway Accountants' Association, of which he is president, and as a member of its committee on a standard system of accounts.



VIEW OF SWITCHBOARD.

At the present time the company operates about 240 miles of track. Since acquiring the St. Paul & Suburban road it has all the street railways in and connecting the two cities and their suburbs. The various lines are shown in the map of the system published herewith. The equipment comprises about 1,000 cars, of which over 600 are motor cars. The great majority of the cars are run in one direction only, Y's being provided at all terminals, and hence have but one controller. The exceptions are cars put on intermediate sections of lines where there is a heavy local traffic during portions of the day; on these lines cross-overs are provided and the cars are run back and forth without turning.

Double truck cars are favored because they are more popular with patrons and cheaper to operate under the conditions which obtain, and, it is believed, are also cheaper to maintain. The large cars are heavier and require more power, but the capacity is greater and the increased cost of power is more than compensated by the saving in trainmen's wages. A single large car will replace a small car and trailer, dispensing with the need of one conductor. This reduction of one-third in the item of wages, about 40 per cent of the operating expense, permits a comparatively large increase in the item of power, which is only about 15 per cent of the total. Also by substituting one car for a two-car train the number of safety gates is reduced. As fast as possible the old cars will be superseded by new ones of the standard type.

One year ago the power used by the company was generated at three separate stations, two of which, known as Nos. 1 and 2, were in Minneapolis and one, No. 3, in St. Paul. The aggregate power of the engines then in use was 10,500 h. p. The plant of the St. Anthony Falls Water Power Company was first put in partial operation January 1, 1898, and was in full operation by February 19, 1898, since which time the old No. 1 power station has been run but 11½ hours, and No. 2 has been abandoned. It was not intended to entirely supplant No. 3 station by the water power plant, and this station still carries a portion of the regular St. Paul service.

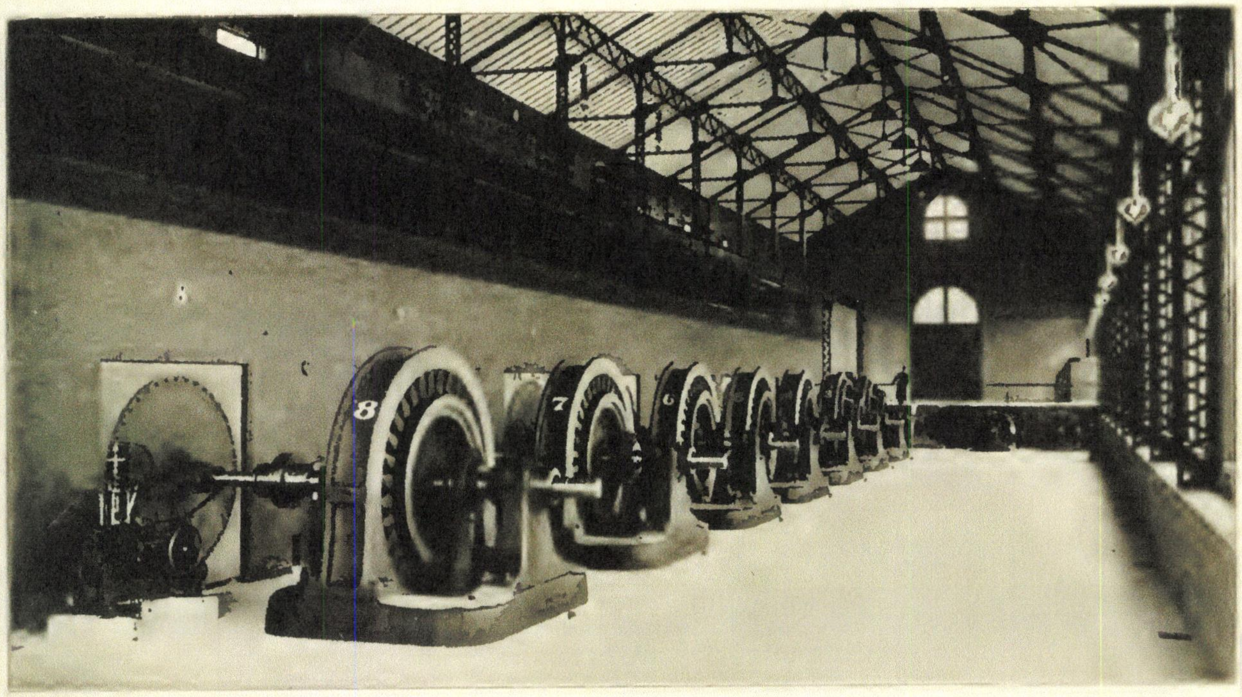
The power station of the St. Anthony Falls Water Power Company is located on the north side of the Mississippi river, at the end of the company's dam, which is commonly called the lower dam. This company owns all of the St. Anthony's Falls water rights, and years ago built the upper dam and leased power to the various mills located on both sides of the river at this point. The fall at the upper dam is 48 ft., and when the lower dam was built its height was limited by the necessity of not interfering with the water power of the mills above. At the lower dam the available head varies from 16 ft. to 21 ft., depending on the stage of the river; the average available acting head is 19 ft. The location of the plant is shown in the accompanying map.

As seen from this map the building is a part of the dam; it has foundations of cut granite and walls of hollow tiling, with sandstone trimmings. The building from outside to outside is about 250 ft. long by 100 ft. wide. The northern portion, constituting the wheel pits, has walls extending 20 ft. above the flood level (which is the same for the wheel pits as for the generator room); this portion is 44 ft. wide, inside measurement. The generator room is about 48 ft. wide at the floor, but the north wall of this room is built over the wheel pits so that a gallery 12 ft. wide is formed at one side. In this gallery are placed the switchboard and transformers. The office of the electrical engineer of the Twin City Company, Edward P. Burch, is also located near the front end of the gallery. From the floor of the generator room to the top of the side walls is 34 ft.; to the ridge of the roof, 45 ft. The roof is of slate, supported on steel trusses. A 40,000 lb. crane, built by Pawling & Harnischfeger, of Milwaukee, travels the entire length of the building.

The dam, as shown in the map, extends in a northeasterly direction, almost parallel to the 10th avenue bridge, for a distance of 400 ft., and then turns at an angle and runs parallel to the northern shore for 544 ft.; at the southern end is a log sluice and near the power house are two bear trap waste gates. The dam is built of cut lime stone laid in concrete cement. To protect the shore a retaining wall, also of granite, was built from the east end of the station to a point opposite the angle in the dam.

The so-called bear trap gates consist of two aprons pivoted at their lower edges and inclined toward each other. One, the lower or down-stream apron, is shorter than the other, which is the gate proper, and has rollers along its upper edge against which the upper apron rests. To raise the gate water is admitted to the space between the two aprons, through a by-pass under the up-stream apron, and forces the two gates up. To lower the gates the upper by-pass is closed and a by-pass connecting the space between the aprons with the water below the dam. As the water flows out from under the aprons they fall, and when completely open the two lie flat, one over the other. The gates at the south end of the dam are three vertical gates operated by screws with ball-bearing nuts. These are operated by a small water wheel.

There is also a wing dam extending from the power house side of the bear traps down below the abutment of the Minneapolis Western Railway bridge, which crosses just east of the power house. This wing dam serves to keep the tail-race clear and protect the power house.



INTERIOR OF POWER HOUSE.

In the main wheel chamber are 14 pairs of 42-in. horizontal water wheels, made by the Stilwell Bierce & Smith Vaile Company; they are of the Victor type. Under the head available these wheels are guaranteed to develop 250 h. p. each. They are mounted in pairs and two pairs coupled, making four 42 in. wheels driving each of the seven generators now installed. At the east end of the power house, in a smaller wheel chamber, are two sets of wheels made by the S. Morgan Smith Water Wheel Company.

The governors were made by the Lombard Water Wheel Governor Company, and seven of them are now installed.

The machines installed now comprise five 700 k. w. three-phase General Electric alternators, with 32 poles, running at 130 r. p. m., giving a frequency of about 35; two 700-k. w. G. E. 8 pole direct current generators, wound for 575 volts at no load and 600 volts at full load; and two 100 k. w. six pole exciters running at 280 r. p. m., giving 575 volts at no load and 600 volts at full load.

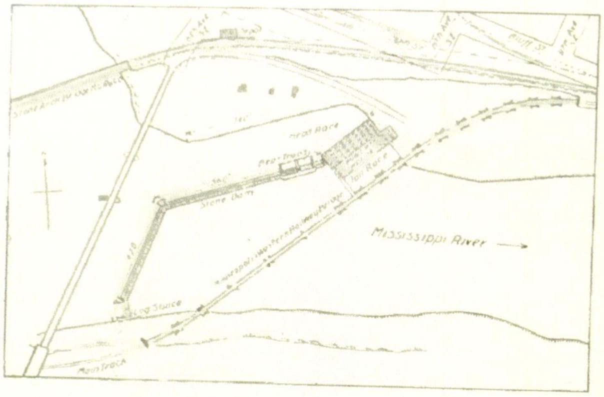
The switchboard is of Vermont marble, with 28 panels, six of which are now blank for the machines not yet installed. The plant was built to contain ten 700 k. w. machines. A good idea of the size and extent of the switchboard may be had from the illustration. The station panel is fitted with one 750-volt illuminated dial Weston voltmeter and one 2,500-ampere, 600-volt Thomson recording wattmeter. The alternating current panels are each equipped with one 200-ampere, dead-beat, inclined coil ammeter, one 5,250-volt voltmeter, one generator rheostat, one high-voltage main switch with porcelain chamber, two single-pole field switches, one two-point phase lamp switch, two pilot lamps, one phase lamp, one potential plug, one 700-k. w. single-phase indicating wattmeter and three fuse blocks.

There are five alternating current feeder panels, each fitted with one 200-ampere, 3,500-volt three-phase Thomson recording wattmeter, three porcelain-chamber, high-voltage coupling switches, one pilot lamp, six busbars at the back, one single-phase indicating wattmeter of 700 k. w. capacity, and three fuse blocks.

The panels for the two continuous current generators are each equipped with one 1,200-2,000 circuit breaker, one 2,500-ampere illuminated-dial Weston ammeter, two single-pole, double-throw main switches, one two-way field switch, one potential plug, one pilot lamp, one resistance lamp and two busbars at the back.

The two exciter panels are next the generator panels and have each one illuminated dial Weston voltmeter, one Weston ammeter of the round pattern, one rheostat, two single pole, double throw main switches, two single-pole field switches, one automatic circuit breaker and two busbars at the rear.

Each one of the railway feeder panels has mounted upon it two 300-500 ampere circuit breakers, two 200-ampere Weston ammeters of the round pattern, one pilot lamp, two single-pole main switches, and there are two busbars at the back.


Stone Arch
Head Race
Power House
Stone Dam
Tail Race
Mississippi River →
Main Track
Bluff St.

MAP OF DAM.

One panel of the switchboard is designed for the purpose of taking care of static discharges. Two divisions are for the 3,500-volt circuits and the third for the 12,000-volt circuit, the latter having a greater number of discharge gaps and more graphite resistance; otherwise, it is the same as the other two. These are connected to the line through switches and can be opened at any time without interrupting the flow of current in the line. This is for the purpose of cleaning and adjusting the discharge gaps with safety. Surmounting the central panel of the switchboard, as a head piece, is a 12 in. dial. The switchboard, which is in a gallery above the generators, as a whole, is a very handsome piece of work.

At the west end of the switchboard gallery are six G. E. static transformers of the standard air blast type. They are each of 223-k. w. capacity, and are used to raise the voltage of the generators from 3,450 to 12,000 volts for transmission to St. Paul.

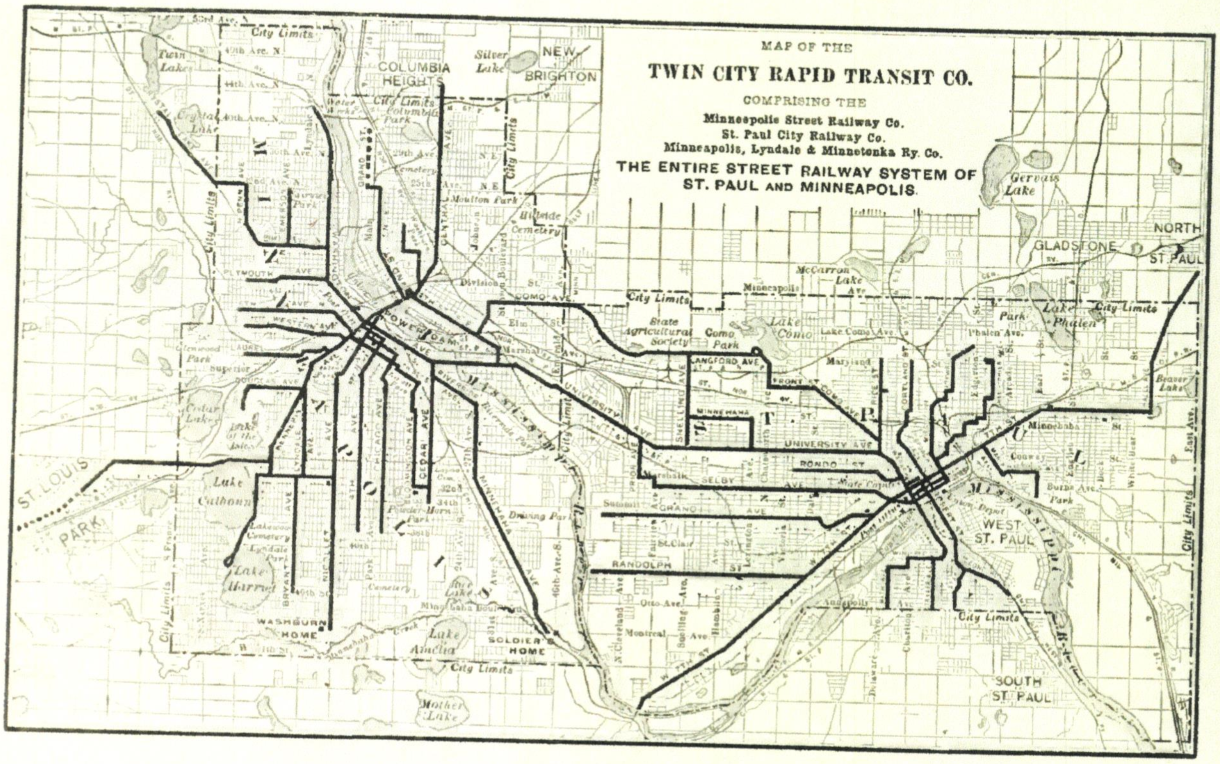
EXTERIOR OF POWER HOUSE.

The building is heated by means of home-made electric heaters and lighted by 13 arc lamps.

The hydraulic work of this plant was in charge of William de la Barre, engineer of the St. Anthony Falls Water Power Company; and the electrical work in charge of Edward P. Burch, electrical engineer of the Twin City Company. Mr. Burch has been with the company for seven years.

The entire output of this plant is leased to the Twin City Rapid Transit Company. Current is transmitted to the three stations of the company in the two cities.

Current is transmitted to station No. 1, which is in the business heart of Minneapolis, through two triple-conductor, paper insulated, lead covered cables, each equivalent to No. 000 B. & S. wire. The distance is 9,000 ft.; voltage, 3,450. In the station are six 215-


MAP OF THE
TWIN CITY RAPID TRANSIT CO.
COMPRISING THE
Minneapolis Street Railway Co.
St. Paul City Railway Co.
Minneapolis, Lyndale & Minnetonka Ry. Co.
THE ENTIRE STREET RAILWAY SYSTEM OF
ST. PAUL AND MINNEAPOLIS.
COLUMBIA HEIGHTS
NEW BRIGHTON
Silver Lake
Twin Lakes
Crystal Lake
City Limits
POWER HOUSE
Lake Calhoun
Lake Harriet
Lake Amelia
Cedar Lake
Lake of the Isles
ST. LOUIS PARK
WASHBURN HOME
SOLDIER'S HOME
Mother Lake
Lake Como
Como Park
State Agricultural Society
Lake Phalen
Gervais Lake
GLADSTONE
NORTH ST. PAUL
WEST ST. PAUL
SOUTH ST. PAUL
UNIVERSITY AVE.
SELBY AVE.
GRAND AVE.
RANDOLPH
MISSISSIPPI

k. w. transformers of the General Electric A. B. type, transforming from 3,300 to 366 volts, and two 600 k. w., 8-pole rotary converters running at 520 r. p. m., and giving 580 volts up to full load.

This station formerly contained two triple expansian Allis Corliss engines, with cylinders 24, $40\frac{3}{4}$, and 56 by 60 in., one simple Allis-Corliss of 400 h. p. and one vertical engine of 400 h. p. The two smaller engines have been removed to make place for the converters and transformers. The triple-expansion engines each have flywheels 28 ft. in diameter and 73 in. face, which drive through jack shafts 16 Edison 175 k. w. and two Edison 80-k. w. generators. The old boilers, two Stirling boilers (2,875 sq. ft. of heating surface each) and five Babcock & Wilcox boilers (3,128 sq. ft. of heating surface each) are still in place, though regularly used only for heating the building.

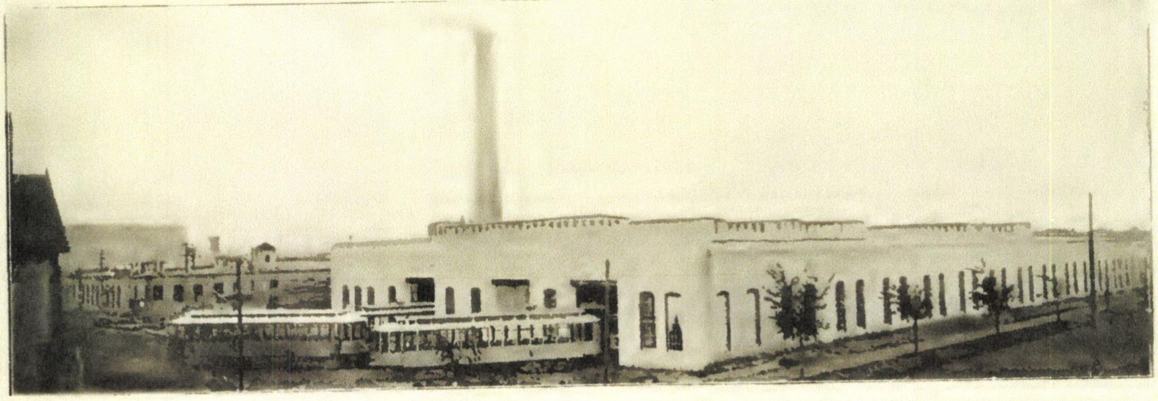
The two triple-expansion engines are available as a reserve. During 1898, after February 19, they were run but $11\frac{1}{2}$ hours, and that was during the severe snow storm of November last, when the water was somewhat low in the river and the demand for power was exceptionally heavy, because the use of snow plows had to be continued during the peak of the railway load.

No. 2 station is in Minneapolis, about $4\frac{1}{2}$ miles from the water power plant, and current is transmitted to it at a voltage of 3,450 over one cable equivalent to a No. 0000 wire. No. 2 contains one 600-k. w. converter and three transformers. This station formerly contained ten 16 and 27 by 16 in. Westinghouse compound engines direct belted to m. p. 270-k. w. T.-H. generators, and seven Stirling boilers of 287 nominal h. p. each. The engines have been removed from this station, but the boilers remain in place and some of them are used for heating the building.

Current is taken to station No. 3, which is in St. Paul, a distance of about 10 miles, over one triple conductor cable of three No. 0 wires. Here are two converters and six transformers. No. 3 formerly contained three triple-expansion Allis-Corliss engines with cylinders 24, $40\frac{3}{4}$ and 56 by 48 in., and one 400-h. p. engine; the small engine has been discarded. As before stated, No. 3 still carries a part of the regular load.

The cables from the water power station to the three sub-stations are all laid underground in cement lined sheet iron pipe, there being about 100,000 ft. of this conduit laid. The pipe is $4\frac{1}{4}$ in. outside diameter and inside the cement lining measures 3 in.

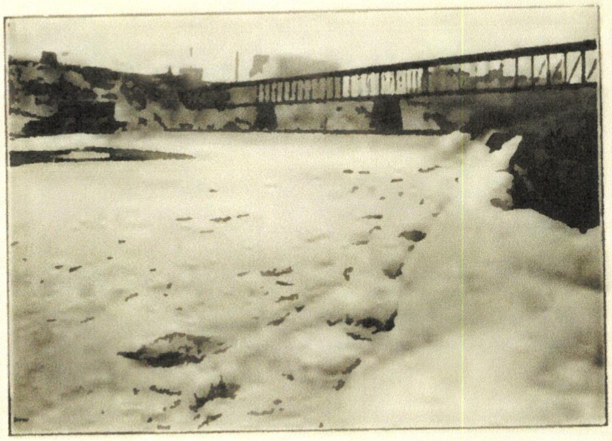
In both Minneapolis and St. Paul are extensive systems of underground low potential feeders which were installed in 1890, when the lines were converted to electricity. These have been supplemented by overhead feeders as extensions were built. The trolley wire is divided into sections of varying length, the length being such that the maximum load on the section is about 300 h. p.



EXTERIOR OF CAR SHOPS.

The Twin City Company has recently acquired the St. Paul & Suburban road, which is a line extending from St. Paul to Wildwood, at White Bear Lake, 12 miles northeast. This line is to be extended eight miles farther to Stillwater, giving a 20-mile road. The power station of this road is known as the Wildwood station and is equipped with two Babcock & Wilcox boilers, two 100-h. p. Ideal engines and two m. p. 4 pole, 90 k. w., T.-H. generators. There is a heavy traffic between St. Paul and White Bear Lake, which is cared for by this station.

The Twin City Rapid Transit Company does a great deal of its own work, probably more than most other roads of the same size, and has extensive shops occupying an entire block in Minneapolis, bounded by West 31st and West 32nd streets and Nicollet and Blaisdell avenues, south. The ground plan of this plant is shown herewith.



THE LOWER DAM.

The building on the northwest corner of the lot is about 65 ft. by 95 ft., three stories high, and was built in 1890; it is occupied by the general storehouse and the offices of the purchasing agent and general store-keeper, A. M. Baldwin, Jr.; the engineer and roadmaster, David Curtin, and the master mechanic, W. M. Brown. The vice-president, Mr. Goodrich, and the general manager, Mr. Hield, keep in very close touch with the work at the shops, and usually spend a portion of each day there, as all requisitions of the purchasing agent and all requisitions on the general storehouse must be approved by the manager. Two rooms on the second floor have recently been fitted up as offices for Messrs. Goodrich and Hield, so that the records, plans, etc., which they wish to keep at this building can be more conveniently arranged.

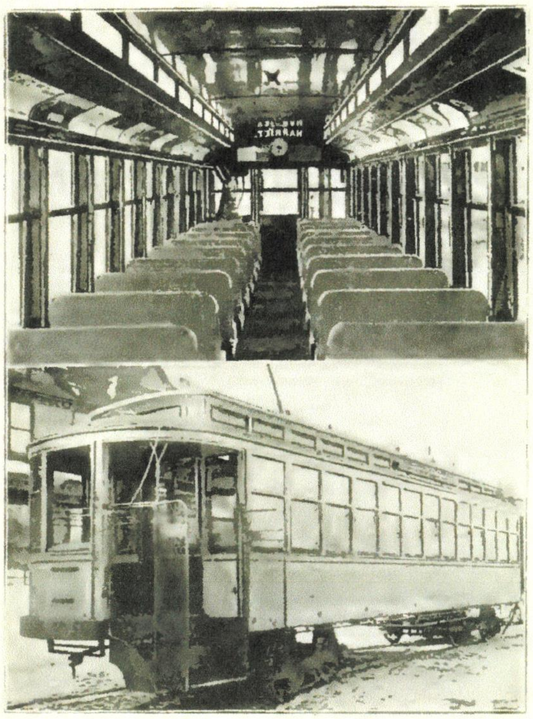
The heavy supplies are arranged in tiers of boxes and bins on the lower floor and the lighter supplies on the second floor. The third floor is used for storing patterns, of which the company has a complete line; the iron castings are about all that it has done outside, and for these it makes its own patterns.

The greater portion of the building joining the storehouse on the south was built in 1884 and was the shop of the Minneapolis, Lyndale & Minnetonka Railway Company (a steam road), which was purchased by the Twin City Company. It is, of course, no longer operated by steam. Various additions have been made to the original building, and it now comprises the machine shop, 94 ft. x 110 ft.; the armature room, 52 ft. x 53 ft.; the brass foundry, about 27 ft. x 52 ft.; the blacksmith shop, 42 ft. x 52 ft., and the general repair shop of irregular shape.

All the repairs for the system are made here, as it is found cheaper to haul disabled cars and apparatus from St. Paul than to keep up the shops and storehouses that would be necessary to make repairs at the car houses. The machine shop regularly employs about 45 men. Its equipment comprises 10 lathes, 6 ft. to 16-ft. bed; 1 turret lathe, 2 power punches, 3 gear cutters, 1 planer, 1 key-seating machine, 2 shapers, 4 Brown & Sharp milling machines, 3 bolt cutters, 2 tapping machines, 2 speed lathes, 1 universal grinder, 5 emery wheel stands, 6 drill presses, 3 sensitive drills, 1 gear blank machine, 1 wheel boring machine, 1 hydraulic wheel press, 1 rail saw, a rail bender for special work, and a full line of tinsmith's tools. For hand work there are 20 vises.

The tool room occupies one corner of the shop, and in it are a milling machine, a lathe, and two grinders kept exclusively for toolmaking. There is a full line of reference and snap gages for close work. The system of checking out tools is combined with the system of checking the time. Each man has a shop number and a bundle of small checks, bearing the same number, on which to draw tools. When he goes to work he receives from the tool room a large check with his number and this is turned in at noon, drawn again in the afternoon, and returned at night.

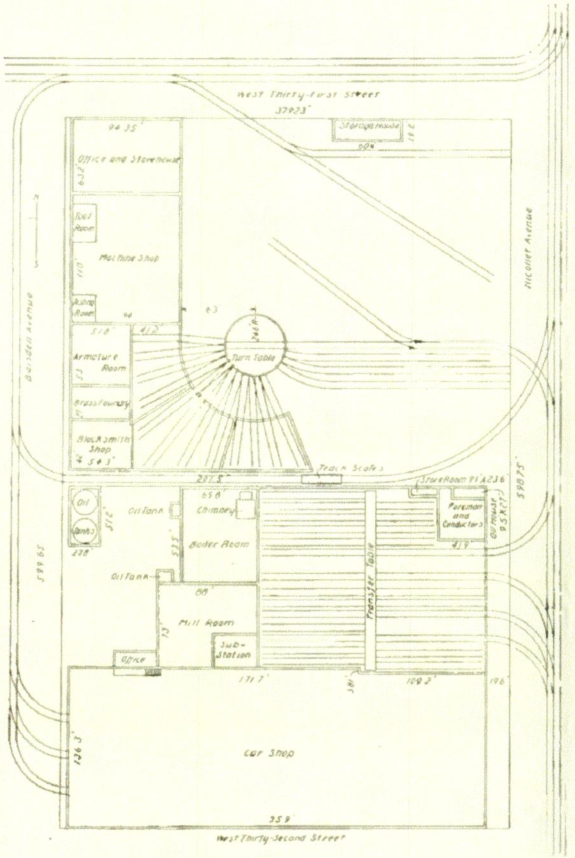
The gear and pinion work, turning trolley wheels, etc., furnish work for several machines. The pinions used on cars are of novel design. They are built up of 75 disks of No. 24 sheet steel, and five disks of raw-hide, punched out and assembled between two 1-in. brass disks. The assembled pinion is subjected to a pressure of 60 tons and five ½-in. steel rivets put through it. When riveted they are placed two at a time in a milling machine and the teeth cut, the steel blanks, being already formed, need only a light cut. One machine will mill 12 pinions in 10 hours. The pinions and the seats for them on the shaft are turned to a taper of ⅝ in. to 1 ft., which greatly facilitates their removal.



VIEWS OF STANDARD CAR.

The cast wheels used are ground and the steel tired wheels turned down in this shop. The company had some trouble with cast wheels breaking under the heavy cars, and now very generally uses steel tired wheels for the motor axles, having about 400 such wheels; when the tire becomes worn thin the wheel is placed on the non-driven axle of the truck.

Throughout the shop the shafting has been carefully arranged so that portions of it may be cut out when the machines are not needed. The shop is driven by one of the discarded traction generators rewound for a motor.



PLAN OF SHOPS.

A great deal of rebuilding has been done in the machine shop and the W. P. 50 motors appear to have come in for their full share. As originally built, these motors had only one field coil containing 165 lbs. (about 165 turns) of No. 3 wire. This coil is replaced by one with 192 lbs. of wire in it, and the lower pole piece is chipped and planed so that a lower field containing 65 lbs. of No. 4 wire may be inserted. These lower field coils are known in the shop as "horse collars." The commutator in this type of motor has been placed outside the pole piece. The shaft is replaced by one 6 in. longer, made hollow at one end, and the leads from the armature carried through the center of the shaft. This arrangement removes the armature from all contact with the dust from the commutator.

In one corner of the machine shop is a small room fitted with the necessary prony brakes and instruments for testing motors. Fuse boxes and lightning arresters are also tested here.

In the armature shop about 13 men are employed, the company doing all its own repair work. One of the labor saving devices here is a shellac stirrer; the shellac is in a barrel mounted in bearings and belted to the line shaft, so that it is always stirred. To draw off shellac for use the belt is thrown off and the barrel stopped. In the armature room are motor cases and brakes for quickly testing armatures.

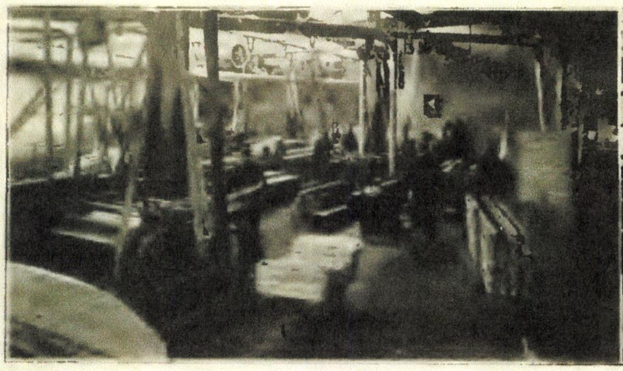
The brass foundry employs four men, who usually make three heats per day each. All the brass castings used are made here. The method of making pinions, which has been described, causes a great deal of the brass turnings and borings to be mixed with steel, and a most ingenious machine for separating these turnings is used. The mixed metal is placed in a hopper, which discharges it into a cylinder having strong magnets on the interior. The iron and steel particles adhere, while the brass drops off as the cylinder turns. The steel is swept off by a stiff brush during the latter part of the revolution and falls into a separate box.

The blacksmith shop is equipped with eight forges, a steam hammer and a trip hammer. There are now 26 men employed, working in day and night shifts.

The general repair shop, which employs 31 men, is in what was the round house of the railroad. There are 12 pits, three of which are long enough to take two cars. One of the pits is fitted especially for dropping the wheels and axles from under cars. The screws moving the wheel platforms are driven from the line shaft. Outside is the turn table, and several tracks for temporarily storing cars are laid in the yard. The scrap pile is also here.

South of the buildings already described is the old 31st street power station and car house of the company, built in 1889. The car house is still so used. It is, approximately, 280 ft. x 158 ft., and has 14 tracks. In one corner is a room for the foreman and car service employes.

The boiler room still has its equipment, seven Stirling boilers, but only enough of these are used to heat the shops. The engines and generators formerly in the room south of this have been removed and a small space in one corner partitioned off for the 600-h. p. converter and the three transformers, which constitute the equipment of sub-station No. 2, before mentioned. The rest of the old engine and dynamo room is now filled with wood-working machinery and called the mill room.



MILL ROOM.

CAR SHOP.

South of the car house is the new car shop, which was completed in April, 1898. This is a building of brick 359 ft. long, outside measurement; the north wall is formed by the old car house, so, while it is 136 ft. 4 in. wide at the west end, the offset in the old wall reduces it to 130 ft. at the east end. Windows 4 ft. wide x 10 ft. 4 in. high are spaced two to each 20 ft. of wall along the south side. At the ends are 14-ft. doors for the entrance and exit of cars, with windows where the wall spaces admit. There are six monitors in the roof, each 20 ft. x 52 ft., affording ample light.

The south wall of the new shop is 21 ft. 6 in. high; the east and west walls 25 ft. 6 in. The roof is 4-ply gravel supported on wooden trusses. The clear space under the trusses is 16 ft. Three rows of 7-in. round cast columns support the roof trusses. From the outside of the south wall to the centers of the first row of columns is 35 ft. 11 in., and the distance between rows 36 ft. The columns are spaced 20 ft. apart in the rows.

Walls have been erected in the exterior corner of the car shop and mill room buildings, forming a two-story building 14 ft. x 36 ft., inside measurement, which is marked office in the general plan. The lower floor is occupied by the stock room, where are kept the bolts, screws, etc., from the time they are drawn from the general storehouse until issued to the workmen. The upper floor is occupied by the master mechanic as his car shop office. The office is reached from the car shop by a flight of stairs, and from the gallery which extends along the side of the office the whole shop is in plain view. Windows in the east wall of the office give a similar view of the mill room, and the yard where lumber is stored may be seen from the exterior windows. The whole office is most conveniently arranged to enable a man to keep the shop under his eye.

The car shop is 11 tracks wide. The south side, three track, is set apart for the paint shop, and this portion has a cement floor with drains to the sewer, so that cars sent in for painting can be conveniently washed here. Throughout the rest of the building the floor is of wood. Arc lamps are provided for lighting, when necessary. Steam pipes are carried along the walls for heating, and in cold weather these radiators are supplemented by hot air from a Sturtevant plant.

The mill room is well equipped with machinery for wood working, a great deal of which was made by the J. A. Fay & Egan Company, of Cincinnati. The mill room machinery includes 1 woodworker, 1 molding machine, 2 rip saws, 1 shaper, 3 planers, 2 cut-off saws, 1 re-saw, 2 jointers, 1 mortising machine, 2 tenoning machines, 1 band saw, 1 Fay boring machine, 1 combination rip and cross-cut saw, emery grinders, and some smaller machines.

There are 74 men in the car shop, not including 13 painters. The capacity of the shop is eight cars per month. It was first opened in April, 1898, though not at that time completely finished. Last year 22 cars of the company's standard type were built and an order of 30 is now going through the shop.

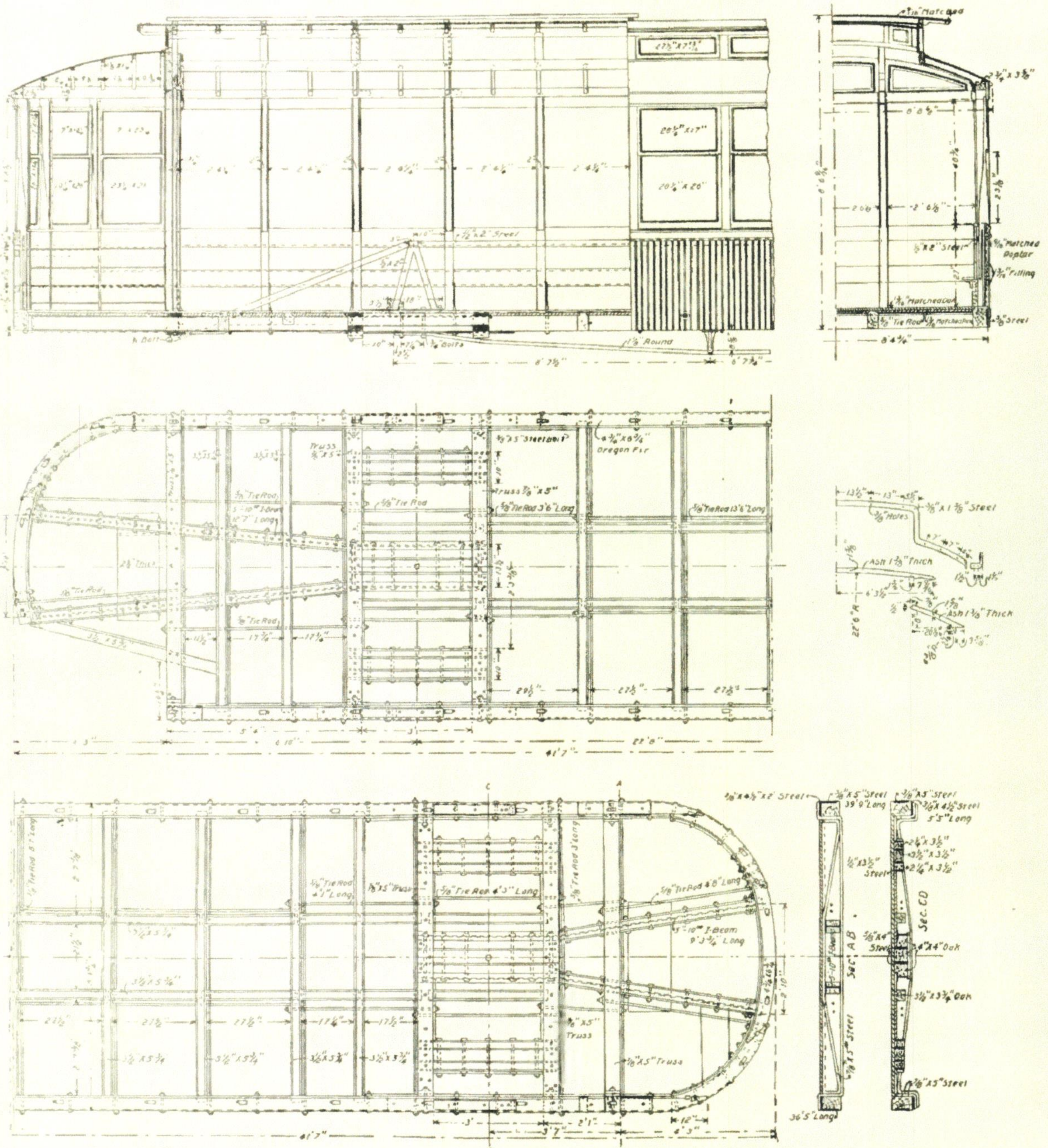
The master mechanic, W. M. Brown, has been with the company for seven years, and has occupied his present position for over three years. He has had an extended experience in car building, and designed the company's standard car.

The foremen of the several shops are: Machine shop, E. Stoudt; repair shop, J. Reardon; blacksmith shop, O. Shoemaker; wood shop, W. H. Day.

The new cars, which are very fully shown in the accompanying illustrations, are regarded with considerable pride by the officers of the company, who feel that no road has any better cars. The greatest care is taken in the selection of material and in the construction, and the aim has been to build the best car possible.

These cars are designed for both summer and winter service; the window sills are but 27 in. from the floor and the two sashes may be slipped down into the side of the car, making practically an open car. The length, as shown in the floor plan, is 41 ft. 7 in., and at the front end is added a buffing timber (bent to conform to the car end) 9 in. thick at the center line of the car. This makes the total length 42 ft. 4 in. The weight of the body is 10 tons; with trucks and motors, 17 tons. The long sills are of Oregon fir, 4¾ in. by 6¾ in.; steel plates ⅜ in. by 5 in. are let into the side sills; the short sills are of oak. The ends of the car are rounded, and both are vestibuled. There is but one entrance, and that is protected by gates of the type described elsewhere. There are two steps, each 11½ in. high, to reach the platform; the steps are of the Stanwood type, made by the Q & C Company.

Over the trucks are two cross trusses (shown in the section CD) spaced 3 ft. 5 in. between centers. These are of ⅞ in. x 5-in. steel. Between these, to receive the center bearing, is a beam built up of three pieces of oak 4 in. x 4 in., two steel bars ⅝ in. x 4 in., and portions of two 5 in. I beams (which support the vestibule ends). Over the side bearings are similar longitudinal pieces built up of three oak pieces and four steel bars ½ in. x 3¾ in. A third cross truss (shown in section AB) is placed under each end of the car body proper. From the innermost truss to the curved platform sill are two 5-in., 10-lb. I-beams; between the inner cross trusses the lower flanges of these I-beams are cut away to reduce the total height of the trusses. Oak filling pieces are placed on each side of the I-beams, as shown in section AB. In each side of the car is a steel truss of ½ in. x 2 in. steel, as shown in the longitudinal section, and the two side sills are further trussed with 1⅛-in. rods.



SECTIONS AND FLOOR PLAN OF CAR.

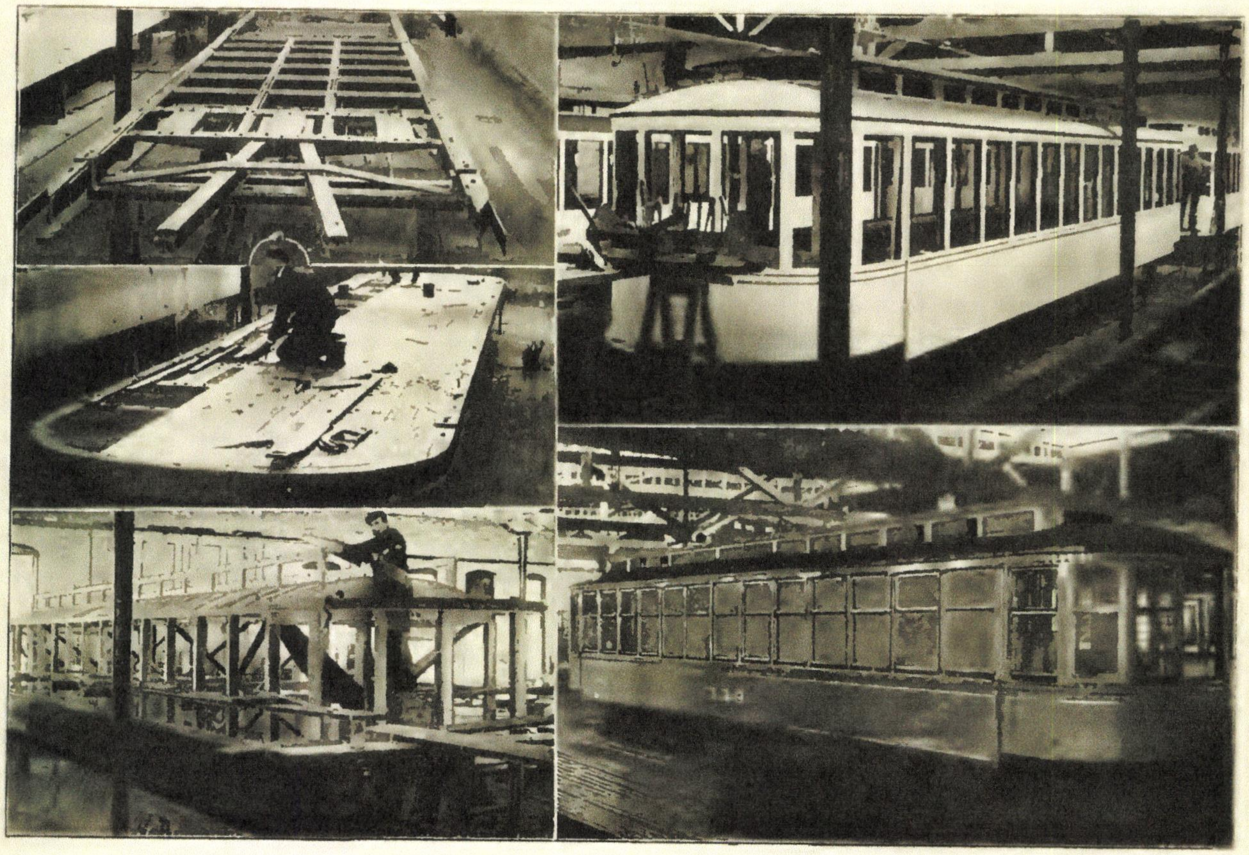
The posts, water tables, and rafters are of southern white ash; the plates are of Oregon fir; the flooring is double, 13-16-in. matched oak on top of 13-16-in. matched pine; the roof is of poplar, covered with No. 6 canvas; the outside sheathing is of poplar, the inner sheathing of 1-in. white oak; the inner finish is of northern red birch, except the ceiling, which is quartered white oak. The details of the rafters are shown in the drawings, and also the details of steel rafters placed at four of the posts to give additional strength to the monitor roof.

This car seats 49 or 51 persons according as the heater is or is not in place. As an experiment one car was fitted with seats upholstered in leather, but the Hale & Kilburn rattan seats were decided upon as preferable, particularly for warm weather. The seat arms are brass, and were cast in the shop, as were also all the fittings.

The car is heated with the Baker hot water heater, and lighted by 20 electric lamps. Electric headlights of the company's own design are used.

The trucks to be used under these cars have not been decided upon; one of the new cars is now in use with Brill trucks.

Nearly all the cars of the company are equipped with safety gates, which were designed several years ago, and have proved so satisfactory in operation that Mr. Goodrich would sooner send out a car without motors than without gates. This last is literally true, as the only cars without gates are trailers, and these are to be superseded by the larger cars now building. The standard type of gate adopted, after mature deliberation and numerous experiments, was fully illustrated and described in the Review for March, 1895, page 154. It is operated by the motorman, who opens the gate after having brought his car to a full stop, and closes the gate before again starting the car. The gates are placed at the extreme outer edge of the step and open outward. It might be thought that bringing the car to a full stop and opening the gate before permitting any passengers to alight would cause a considerable loss of time, but such is not the case; what time is lost by operating the gates is more than gained by the quicker stop and quicker start that can be made when the motorman absolutely knows that no one is attempting to leave or board the car while it is in motion.



STAGES IN THE CONSTRUCTION OF THE CAR.

When the Twin City Company first began to operate by electricity it was insured in a casualty company which failed and left the Transit Company with damage claims aggregating $100,000 to settle. As a preliminary step to finding a means of preventing these accidents, Mr. Goodrich analyzed the causes of accidents, dividing them into 23 classes, and it was found that the most expensive and troublesome accidents were those caused by persons boarding or leaving cars when in motion. The adoption of safety gates followed.

How successful the remedy proved is shown by the following table, which gives the number of accidents on the Minneapolis division for the years 1898 and 1895, occurring from these causes. But few cars had gates in 1895. Some trail cars are without gates at the present time.

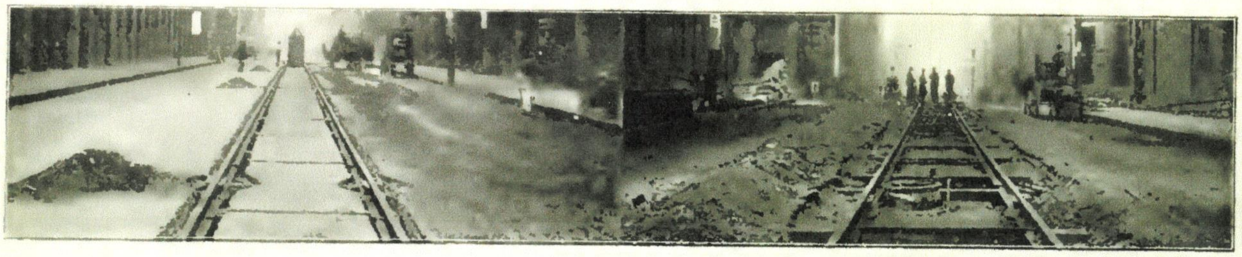
Cause.	1898	1895
1. Boarding moving cars.	32	83
2. Leaving moving cars..	55	141
3. Cars starting, alighting or boarding	23	14
4. Fell, alighting or boarding	35	71
5. Fell on or off car	8	36
6. Fell on curves	0	4
Total	153	349

In connection with these figures it must be remembered that in the four years the mileage and number of cars operated have increased nearly 100 per cent.

The other causes of accidents, as separated in the company's records, are: 7. Cars off track. 8. Collisions, cars. 9. Collisions, persons. 10. Collisions, vehicles. 11. Collisions, animals. 12. Cable slot injury. 13. Center pole injury. 14. Employes injured on duty. 15. Electric shock, persons. 16. Electric shock, animals. 17. Frightened horses. 18. Disturbances on cars. 19. Trouble on account of fare. 20. Ejections from car. 21. Miscellaneous. 21a. Gate injury. 21b. Bicycle accidents.

The Twin City Company was one of the first to experiment with the concrete beam track construction, and the construction adopted by it in streets paved with asphalt has been described in the Review. In February, 1897, we published sections of the standard trench work of this company, showing 5-in. T-rails. There have been several miles of concrete beam track built since that time, but in the new work a deeper rail, 7-in., 80-lb. T. is used. This height of rail is preferred principally because it permits the use of a deeper toothing block.

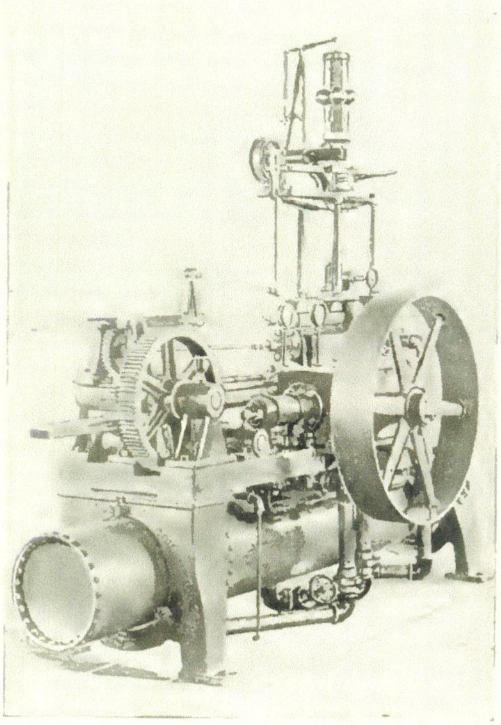
When the street is to be newly paved throughout at the time this roadbed is put down, the method of procedure is as follows: The paving contractor lays down the concrete foundation over the entire street, leaving two or four trenches (as the case may be) where the rails are to be; the paving foundation is usually of American cement concrete, 8 in. deep. The beams supporting the rails are of Portland cement concrete 15 in. wide x 8½ in. deep. In laying the rails they are levelled properly and supported temporarily on ties. Tie rods 2 in. x ⅜ in. are spaced 10 ft. apart to preserve the alignment. Then the concrete is put in place, and filled in about the base to within 2½ in. of the head, the ties being withdrawn as the work proceeds. A wooden form is laid against the inner edge of the rail when the concrete is tamped, to leave a space for the toothing blocks. The joints are cast-welded by the Falk process, and the welding gang keeps just ahead of the concrete gang in building the track.



CONCRETE CONSTRUCTION IN PAVED AND UNPAVED STREETS.

The cost, exclusive of rails and joints (the railway paying the cost of paving from outer rail to outer rail), is about $3.10 per lineal foot of single track.

There are now about 15 miles of this construction in the two cities. About 60 miles of the company's track has cast-welded joints. The engineer and roadmaster who has charge of this work is David Curtin. One of the illustrations shows the process of construction in a street already paved with asphalt.



LOMBARD GOVERNOR, TYPE "B."

Another view of the water wheel governor, shown at the extreme left of the engraving of the interior of the power house on page 75, is given herewith. The other six governors in the station are not visible in that illustration, being concealed by the generators. As may be seen on page 75, the governor is directly geared to the gate stem coming out through the head of the water wheel case, and thus the governor positively connected to the water wheel gate through one pair of gears only. These governors are the type B made by the Lombard Water-Wheel Governor Company, and the regulation of the plant under street railway load variations is within 3 per cent. This type is the most improved form made by the Lombard Company, which builds eight distinct types of water wheel governors, adapted to the various requirements found in practice.

The Lombard governors are now used to regulate about 80,000 h. p. of water wheels in this country, besides being used quite extensively abroad. The direct connection used here has also been adopted in a number of other large plants in this country, using the same type of governors, and has been found entirely satisfactory.

NEW COMPRESSED AIR COMPANY.

The Compressed Air Motor Company is the name of a new corporation organized in Chicago to promote the use of compressed air for street car service and to build and sell the motors. The officers are: W. J. Chalmers, president; H. G. Cooke, vice-president and manager; Alexander Soper, treasurer; and Charles W. Hinckley and W. R. Donaldson, directors. Mr. Cooke is already known in compressed air work, as also the engineer, Robert Hardie.

POWER PLANT OF THE THIRD AVENUE RAILROAD.

When the Third Avenue Railroad Company, of New York, decided to adopt electricity for a motive power on all its lines it was necessary to make provisions for one or more power stations of great capacity. Plans were made to construct one mammoth station on the Harlem river, between 216th and 218th streets, which was to supply current not only for the downtown districts, but also for lines far north into Westchester county. Alternating currents will be generated and transmitted at high potential to 30 or more sub-stations containing step-down transformers and rotary converters, and from these direct current will be fed into the trolley lines at suitable points throughout the city. The normal capacity of the station will be 64,000 h. p. but capable of carrying an overload of 50 per cent.

It was essential that a work of such magnitude be well done and by responsible firms, so the railroad company invited several of the largest electrical concerns to submit plans and bids for the entire undertaking. As mentioned last month the contract was awarded to the Westinghouse Electric & Manufacturing Company and Westinghouse, Church, Kerr & Co. drew the plans for the station.

The power house will be an imposing structure of brick and terra cotta, and its architectural effect will be gained by its color and huge proportions. It will be under two roofs, one arch covering the engine room and that over the two-story portion will cover the boilers. Alongside the river will be docks for unloading the coal boats, and coal handling machinery for conveying the fuel to a bin of 10,000 tons capacity. The coal after passing through automatic weighing machines is deposited into the hoppers and then into mechanical stokers. Machinery will convey the ashes out of the build-plow in front, attached to the sweeper, the leads from the motor which operated the brooms being carried back to the plows of the next car. This train was made up of three motor cars and one sweeper.

In many places along the line the slot was found to have been closed with solid ice. Whenever this was the case gasoline was sprinkled along the slot and then it was burned out, so as not to injure the plow in any way. Apparently the snow in the slot had no appreciable effect as the cars were running the next morning. The company did not lose a single motor during the entire month.

The clearing of such a tremendous quantity of snow from the tracks, and the operation of cars so quickly, was commented upon by the papers of the city in a manner most favorable to the company, and it was, in fact, a great achievement.

Two of the engravings show views in front of the office of the Metropolitan Railroad Company on East Capitol street, between 14th and 15th streets—one before and the other after the tracks were cleared. In the group No. 1 is a view taken at the corner of First and East Capitol streets, looking west; No. 2 shows a sweeper and train of motor cars leaving the car house; No. 3 is a view on East Capitol street, between 1st and 2d streets; No. 4 shows East Capitol street, looking east, on February 14, 1899; No. 5 shows the start from the car house at 14th and East Capitol streets on the morning of February 14 (the plow in front of the sweeper is 4 ft. high); No. 6 is a view of 1st street just north of East Capitol, looking north.

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GUSTAVE SUCKOW.

There is doubtless no one who is better known to the street railway managers and purchasing agents of the country than is Gustave Suckow, the genial general manager of the Vose Spring Company, of 25 Murray street, New York. Mr. Suckow grew up with this company, commencing with it when 13 years old, and has been with it for over 22 years. A considerable portion of this time he represented the company on the road, and has been general manager for several years.

The Vose springs have been on the market for many years and are well known among the trade for their quality and durability; the name "Vose" stamps them as being the best. Mr. Suckow has received many testimonial letters from customers which show the high repute which the goods hold. Though the company is an old one, it keeps abreast of the times and does not let its products deteriorate from the high standard set by the late Col. Richard Vose, whose rule of action was: Good quality and good workmanship will hold the trade. Many of the ideas embodied in the Vose springs as made at present are the result of the experience of Mr. Suckow.

GUSTAVE SUCKOW.

Among the company's products are the rubber center yoke springs which claim the distinction of being the only ones that will live in the journal boxes of electric cars, the Vose patent rubber and iron core springs, the Vose elliptic springs, coil and elliptic springs for all the standard electric trucks, trolley springs and bush holder springs, rubber springs, washers and cushions, rubber blocks for elliptic springs, etc.; a complete list would include any and all kind of springs. Mr. Suckow will gladly correspond with anyone who finds his cars not running satisfactorily.

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There is a bill in the Missouri legislature providing for vestibules on street cars during the winter months, under a penalty of from $5 to $50 for each violation.

The Buffalo & Niagara Falls Electric Railway has subscribed $7,500 and the Lockport Electric Railway $2,500 to the fund for the Pan-American Exposition.

CONSOLIDATION IN DENVER.

The Denver City Tramway Company was incorporated March 3 and effects the consolidation of the Denver City Railroad, which now has 5 miles of horse railway, 11 miles of electric, and 30 miles of cable railway, and the Denver Consolidated Tramway which has 100 miles of electric road. C. K. Durbin, general superintendent of the latter road, advises us that if the permission of the city authorities is obtained the new company will spend half a million dollars in improvements during the next year, putting from 500 to 1,000 men at work at once. The improvements contemplated comprise a central power station located on the Platte river between 15th and 19th streets, the change of the present cable lines to electric, and the rebuilding of the Broadway line.

The capital of the new company is $5,000,000 and its officers are: President, Rodney Curtis; vice-president, William N. Byers; secretary, W. G. Evans; treasurer, G. E. Ross-Lewin. All of these held similar positions with the Denver Consolidated Tramway Company. No changes will be made in the other officers or employes of either of the old companies.

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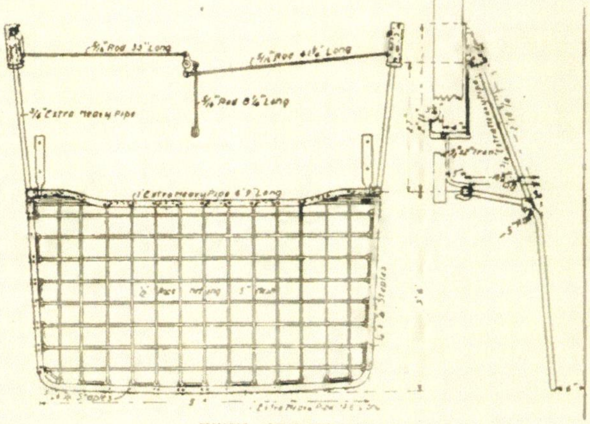
THE TWIN CITY FENDER.

As noted in our February, 1899, issue the Twin City Rapid Transit Company, of Minneapolis and St. Paul, by means of safety gates and fenders has been able to greatly reduce the number of accidents involving personal injuries. The gates were fully shown in that issue, and we herewith illustrate one type of the fenders, with which nearly all the company's cars are equipped. The drawing shows the type first adopted and the slight modifications since made will be mentioned later. The frame is made of extra heavy 1-in. piping and fittings bent as shown in the diagram; staples of ¼-in. round iron are spaced 5 in., center to center, and ½-in. rope run through them to make a netting. The frame is hung from hooks and held in its normal position by two struts of ¾-in. extra heavy pipe, one at each side. One end of the strut is fastened to the fender frame and the other rests in a cast iron pocket bolted to the car sill; in each pocket is a dog which when pulled out (by means of the mechanism shown in the cut) when the motorman presses the tripping lever with his foot, permits the strut to go to the bottom of the pocket and the fender to fall to the rail. Normally the front edge of the fender is carried 6 in. from the rail on level track. The newer fenders are made 2 ft. 10 in., instead of 3 ft. 6 in., long, and the front corners are bent to a larger radius so that they do not project so much as that shown. Wire is substituted for rope, and run through holes in the pike frame instead of through staples.



TWIN CITY FENDER.

These fenders are made by the company in its own shop, after its own designs and at small expense.

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The Monongahela Connecting Railway Company, of Pittsburg, has been authorized by the city council to build an overhead bridge on Second avenue, near Bates street, in order to do away with a grade crossing.

Street Railway Journal

Vol. XIX. NEW YORK AND CHICAGO, MARCH 1, 1902 No. 9.

THE TWIN CITY RAPID TRANSIT COMPANY

A STUDY IN FINANCIAL AND OPERATING POLICY

The remarkable rise in the market value of the stock of the Twin City Rapid Transit Company, of St. Paul and Minneapolis, during the past year has attracted much attention to that property, not only on the part of stock exchange speculators, but street railway managers. A study of the system which could make such a showing will be of considerable interest at this time. It often happens that in the manipulations on the stock exchange the quotations of the stock rise far beyond its intrinsic value as an investment, and the market value of the stock is not always, by any means, an indication of its true value. But a recent survey of the street railway situation in the Twin cities, made by a representative of the Street Railway Journal, seems to show that the rise in value of Twin City Rapid Transit stock is founded on something more solid than bull rumors on the stock exchange, and that the physical and financial condition of the property is such as to make an account of the financial policy and methods of operation which has led up to such a satisfactory condition of value to all street railway owners and operators.

The Twin City Rapid Transit Company, as is generally known, controls all the street railway lines in Minneapolis and St. Paul, the two interurban lines between the two cities, and also an interurban line running from St. Paul by way of White Bear Lake to Stillwater, a distance of 20 miles from the center of one city to the center of the other, making 251 miles in all. Franchises are such that this company is given a practical monopoly of the streets of St. Paul and Minneapolis for street railway purposes during the life of its charter, which expires in 1941. Like many other companies, this is a consolidation of a number of local street railway lines.

WASHINGTON STREET AND HENNEPIN AVENUE—THE OLD AND THE NEW IN ELECTRIC CARS

The St. Paul and Minneapolis lines were among the first large city systems to be electrically equipped, consequently, when the Twin City Rapid Transit Company was formed in 1891, the rolling stock and track were, of course, in anything but a desirable condition. At that time improved enclosed motors were beginning to come in, and the importance of heavy track construction was also beginning to be apparent. How to meet the expense of the general reconstruction and renewal of equipment, without increasing the company's liabilities by issuing more bonds or stock, was the problem which confronted the management. About the time the reconstruction of the system was begun came

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the panic of 1893, which, however, did not show itself in full force as affecting the earnings of this company until 1894, 1895, 1896 and 1897. During all this trying period the management was boldly putting the money earned back into the property in the shape of betterments of a permanent character, with little or no returns to the stockholders, and it is now having the satisfaction of seeing its policy vindicated by the excellent financial condition which the company is in, having paid last year 4 per cent on its preferred stock, with every prospect that this can be continued and increased, even with the large expenditures for improvements that are contemplated.

TABLE I.—PASSENGER EARNINGS, 1878–1901

YEAR	Gross Passenger Earnings	Per Cent	YEAR	Gross Passenger Earnings	Per Cent
1878.......	$65,157.60	....	1890......	$1,383,865.82	43.76
1879.......	87,005.07	33.53	1891......	1,814,739.86	31.13
1880.......	111,085.21	27.68	1892......	2,136,657.52	17.74
1881.......	178,298.93	60.51	1893......	2,164,925.31	01.32
1882.......	279,501.27	56.76	1894......	1,981,705.64	—08.46
1883.......	399,725.84	43.01	1895......	1,964,772.65	—00.09
1884.......	478,009.87	19.59	1896......	2,037,934.80	03.72
1885......	519,291.00	08.64	1897......	1,982,785.20	—02.78
1886.......	666,295.79	28.31	1898......	2,145,092.95	08.19
1887.......	824,481.78	23.72	1899......	2,476,879.75	15.47
1888.......	980,470.41	18.92	1900......	2,814,205.10	13.62
1889.......	962,645.28	—01.82	1901......	3,150,497.85	11.95

TABLE II.—STATEMENT FOR TEN YEARS.

	YEARLY STATEMENTS									
	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901
	$	$	$	$	$	$	$	$	$	$
Passenger Earnings	2,136,657.52	2,164,925.31	1,981,705.64	1,964,772.65	2,037,934.80	1,982,785.20	2,145,092.95	2,476,879.75	2,814,205.10	3,150,497.85
Miscellaneous Earnings	50,922.42	24,231.89	21,972.72	24,030.79	21,282.77	26,335.78	25,623.06	45,914.10	25,150.68	23,478.00
Total Earnings	2,187,579.94	2,189,157.20	2,003,678.36	1,988,803.44	2,059,217.57	2,009,120.98	2,170,716.01	2,522,793.85	2,839,355.78	3,173,975.85
Maintenance of Way and Structure	108,060 79	98,930.65	66,606.77	58,069.49	62,738.27	76,876.57	73,837.27	33,820.00	61,086.45	85,989.88
Maintenance of Equipment	211,264.28	217,381.77	126,349.90	103,537.87	121,845.98	130,576.21	131,368.30	165,364.44	159,834.60	179,768.43
Operation of Power Plants	226,986.70	229,357.67	161,374.85	154,103.73	156.764.47	133,828 58	129,805.69	147,467.12	170,661.74	217,946.98
Car Service	656,264.99	624,456.77	474,537.17	474,246.17	480,384.67	469,232.93	497,413.34	6[illegible],691.79	641,195.90	646,692.36
General Expense	130,207.93	105,088.73	75,141.69	80,073.17	77,042.70	94,457.35	95,884.29	105,855.79	156,472.35	149,798.10
Legal Expense	13,786.15	18,614.53	17.037.75	14.925.02	19,275.70	18,701.20	23,442.38	21,999.92	22,999.91	22,999.92
Injuries and Damages	51,503.79	97,436.16	106,813.90	80,890.99	65,587.07	72,000.00	58,492.63	72,910.64	82,948.61	97,139.91
Insurance	20,514.15	18,965.70	16,685.15	13,637.96	11,5[illegible].64	6,407.54	6,148.24	6,862.67	9,489.55	15,116.12
Total Operating Expense	1,418,588.78	1,410,231.98	1,044,547.18	979,484.93	995,158 50	1,002,080.38	1,019,392.14	1,156,972.37	1,304,689.11	1,415,451.70
Net Earnings from Operation	768,991.16	778,925.22	959,131.18	1,009,318.51	1,064,059.07	1,007,040.60	1,151,323.87	1,365,821.48	1,534,666.67	1,758,524.15
Taxes	54,064.48	51,143 69	52,938.69	49,071.11	58,170.42	66,469.05	64,214.11	71,905.69	90,300.50	119,000.00
Interest on Debt	474,360.18	611,490.58	686,022.40	701,767.94	626,356.73	625,833.81	593,600.07	556,337.19	534,025.13	547,637.57
Total	528,424.66	662,634.27	738,961.09	750,839.05	6[illegible]4,527.15	692,302.86	657,814.18	628,242.88	624,325.63	666,637.57
Surplus Applicable to Dividends	240,566.50	116,290.95	220,170.09	258,479.46	379,531.92	314,737.74	493,509.69	737,578.60	910,341.04	1,091,886.58
Dividend on Preferred Stock	----------	----------	----------	----------	79,534.00	79,604.00	119,854.00	187,553 34	204,750.00	210,000.00
Dividend on Common Stock	----------	----------	----------	----------	----------	----------	----------	375,250.00	450,300.00	600,400.00
Total Dividends	----------	----------	----------	----------	79,534.00	79,604.00	119,854.00	562,803.34	655,050.00	810,400.00
Transferred to General Surplus	240,566.50	116,290.95	220,170.09	258,479.46	299,997.92	235,133.74	373,655.69	174,775.26	255,291.04	281,486.58
Per Cent Total Operating to Total Earnings	64.85	64.42	52.13	49.25	48.33	49.88	46.96	45.76	45.95	44.60
Per Cent Total Operating to Total Increase Taxes	67.31	66.76	54.77	51.72	51.15	53.18	49.92	48.71	49.16	48.35

The earnings from 1878 to 1901 show some very peculiar variations, as can be seen by the accompanying Table I., giving the gross passenger earnings and increase for each year over the previous year.

TABLE III.—BONDED DEBT AND PREFERRED STOCK.

1st Mtg. Minneapolis & St. Paul Sub.	$500,000	5%	$25,000
1st Mtg. Minneapolis	250,000	7	17,500
2d Mtg. Minneapolis	600,000	6	36,000
1st Cons. Minneapolis	4,150,000	5	207,500
1st Mtg. St. Paul	680,000	6	40,800
Cable Cons. St. Paul	3,708,000	5	185,400
General Cons. Bonds	1,000,000	5	50,000
Preferred Stock	3,000,000	7	210,000
	$13,888,000	5.56	$772,200

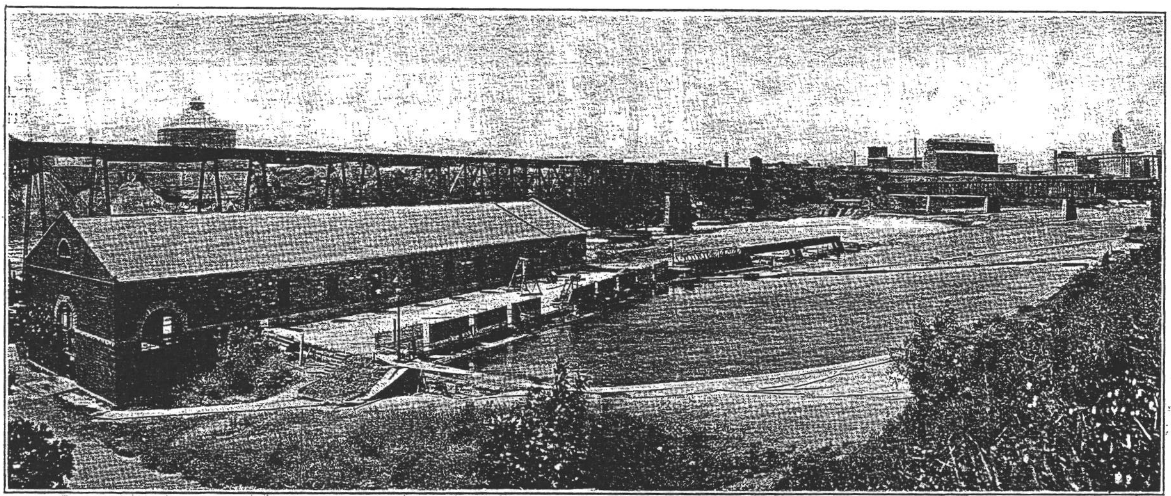
From this table it is seen what effect the panic of 1893 had, and how long its effect lasted. There was a marked decrease in earnings in 1897 over 1896, due, in part, possibly to an increase in the use of bicycles for business purposes.

TABLE IV.—ITEMS REDUCED TO MOTOR CAR MILES AND HOURS

	1901			1900			
		Motor Miles	Motor Hours		Motor Miles	Motor Hours	% + or —
	$	$	$	$	$	$	$
Gross Passenger Earnings	3,150,497.85	.2733	2.30	2,814,205.10	.2475	2.04	+11.95
Miscellaneous	23,478.00	.0019	.02	25,150.68	.0022	.02	— 6.65
Total Earnings	3,173,975.85	.2752	2.32	2,839,355.78	.2497	2,06	+11.79
EXPENSES.							
Maintenance Way & Structure	85,989.88	.0074	.06	61,086.45	.0053	.04	+40.77
" of Equipment	179,768.43	.0156	.13	159,834.60	.0141	.12	+12.47
Operating of Power Plants	217,946.98	0189	.16	170,661.74	.0150	.13	+27.71
Car Service	646,692.36	.0561	.47	641,195.90	.0564	.46	+ .86
General Expense	149,798.10	.0130	.11	156,472.35	.0138	.11	—04.27
Legal	22,999.92	.0020	.02	22,999.91	.0020	.02	
Injuries and Damages	97,139.91	0084	.07	82,948.61	.0073	.06	+17.11
Insurance	15,116.12	.0013	.01	9,489.55	.0008	.01	+59.29
Total Operating Expense	1,415,451.70	.1227	1 03	1,304,689.11	.1147	.95	+ 8.49
Net Earnings from Operation	1,758,524.15	.1525	1.29	1,534,666.67	.1350	1.11	+14.59
Int. on Debt & Dividends Pfd. Stk	757,637.57	.0657	.55	737,875.13	.0650	.53	+ 2 68
Taxes	119,000.00	.0103	.09	91,200.50	.0079	.07	+30.48
Total Int. Chgs, Taxes, Divs., etc.	876,637.57	.0760	.64	829,075.63	.0729	.60	+ 5.73
Surplus	881,886.58	.0765	.65	705,591.04	.0621	.51	+24.99

In 1899 came an increase of 15 per cent over 1898, and for the last three years there has been a good increase each year, that for 1901 being 11.95 per cent over 1900.

The company has always kept very complete records as to all details of operation, and to any street railway man or investor these figures have been willingly thrown open for inspection and comparison. Auditor J. F. Calderwood, ex-president of the American Street Railway Accountants' Association, and one of the men most influential in the establishment of that organization, ranks second to none in the matter of keeping detailed accounts in such shape that information of value can be quickly obtained from them. Vice-President C. G. Goodrich, who has had charge of the shaping of the policy of the company, has always made good use of the figures which Mr. Calderwood, by his thorough accounting methods, has been able to furnish. One of the secrets of the successful management of this company has been the thoroughness of the accounting system which has enabled those in charge to determine exactly how the money was being spent, and in what way improvements could be made. The detailed statements as to earnings and operating expenses can be found in Table II., which gives the various items for the years 1892 to 1901. A careful study of this table is necessary to a full understanding of the situation. It might be mentioned that in the eight years previous to 1901 the liabilities of this company have been increased only 5 per cent, while the gross earnings have been increased 45 per cent. In other words, such improvements and enlargements have been made that 45 per cent more business was taken care of in 1901 than was handled in 1894, and this with only 5 per cent increase in the capitalization upon which interest should be paid. It will be noticed in Table II. that there has been a steady decrease in the percentage of operating expenses to the total earnings, and this in spite of the reconstruction that has taken place, which will be mentioned in detail later, and which has been charged directly in as operating expense.



VIEW OF DAM AND HYDRAULIC PLANT AT ST. ANTHONY FALLS

To enable a better understanding of Table II., the statement of funded debt and fixed charges in Table III. is necessary. There is in addition to this common stock issued to the amount of $15,010,000, making liabilities $111,147 per mile of single track.

TABLE V.—ITEMS REDUCED TO MOTOR MILES, &C.

	1901				1900			
	Cents per M/M	Dollars per M/HK	Per Cent Earnings	Cents per Rev. Pass.	Cents per M/M	Dollars per M/HK	Per Cent Earnings	Cents per Rev. Pass.
Maintenance of Way & Structure	.74	.06	2.71	.14	.54	.04	2.15	.11
Maintenance of Equipment	1.56	.13	5.66	.28	1.40	.12	5.63	.28
Operating of Power Plants	1.89	.16	6.87	.35	1.50	.13	6.01	.30
Car Service	5.61	.47	20.37	1.03	5.64	.46	22.58	1.13
General Expense	2.47	.21	8.99	.45	2.39	.20	9.58	.48
Total Operating	12.27	1.03	44.60	2.25	11.47	.95	45.95	2 30
Net Earnings	15.25	1.29	55.40	2.75	13.50	1.11	54.05	2.70
Fixed Charges	7.60	.64	27.62	1.39	7.29	.60	29.20	1.46
Surplus Earnings	7.65	.65	27.78	1.36	6.21	.51	24.85	1.24

In Table IV. the receipts and items of operating expense are reduced to a motor car mile basis, from which comparisons can be made with other roads, and in Table V. some of the items are given in motor car miles and motor hours with relation to the gross earnings, and per revenue passenger. Having now a general survey of the situation, it is in order to take up the various details which go to make up the equipment and management of the property.

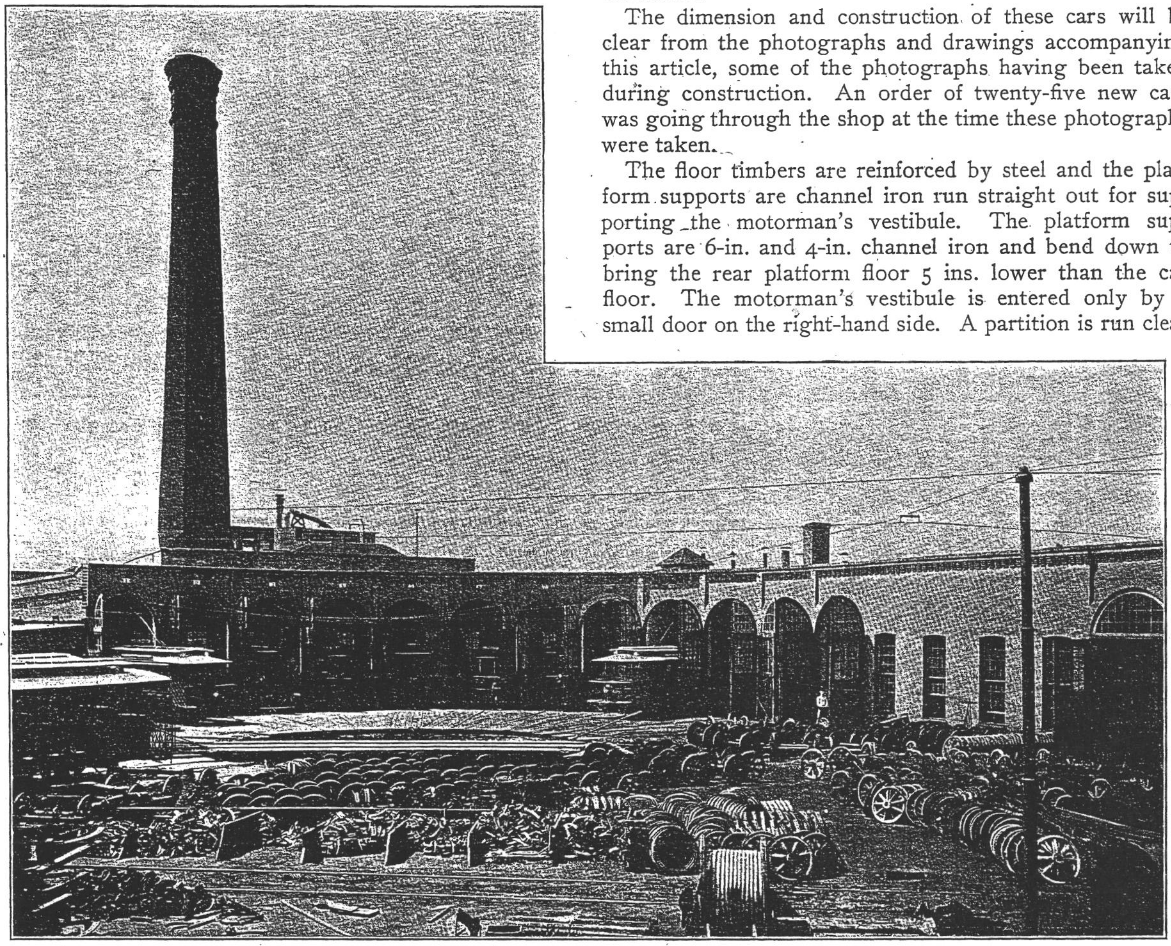
TRACK

The foundation of all successful operation is good track. The company having been under the same management from the beginning until the present time, has not attempted to get cheap track work for the sake of a temporary fine showing to the directors and stockholders, but has laid the best track the state of the art at the time has suggested. It has been constantly at work since its organization in 1891 improving its track, and new track, when laid, has been of as permanent construction as could be put down. At the time the company was organized there were miles of track in the two cities that were not needed at the time, and the cities have been gradually growing to a size commensurate with the mileage. There has, therefore, been no attempt to build extensions, but simply to maintain and relay the track already down. There are now 251 miles of track in the city and interurban systems. Of this 76 miles have cast-welded joints. Twenty-five miles of the construction on paved streets is an 80-lb. T-rail, 7 ins. high, laid without ties, with a concrete beam under each rail. These concrete beams supporting the rails are 15 ins. wide x 8½ ins. deep. The track is held to gage by tie-rods 10 ft. apart, the flangeway for the wheels is made with granite block toothing in asphalt streets, and brick in brick-paved streets. For those cities which bar the use of the T-rail in paved streets, Minneapolis streets are a splendid example of the advantage of this rail. For unpaved streets the standard construction is an 80-lb. T-rail, A. S. C. E. standard, as used on steam roads. Most of the rest of the track is 56-lb. and 60-lb. rail.

The life of a cast-welded joint T-rail on concrete as laid in paved streets, of course, is not known, but that it will exceed anything used heretofore in street railway practice seems certain. Being laid on concrete without the use of wooden ties, the track will not go down by the rotting of ties, and the joints being cast-welded will wear no faster than the adjoining rail. The question then seems to be how long it will take the car wheels to reduce the cross section of the rails to a point where it cannot be used. As there is no tram or flange on a T-rail, as there is on the girder rail, the life of a T-rail must be considerably longer than a girder. Having put its track in permanent shape, the company is, of course, in position to operate much more cheaply than if the track renewals had been made on the basis of getting the cheapest work possible. This Mr. Goodrich assigns as one of the reasons for the company's satisfactory annual reports for the last three years.

ADOPTION OF LONG CONVERTIBLE CARS.

This company early appreciated the advantages in economical operation, maximum service with given investment and public preference for long double-truck summer and winter cars. All new cars are of this type, and the single-truck open and closed cars with old motor equipments are gradually being relegated to the reserve list. There are 225 long cars out of 600 motor cars.


ROUND HOUSE FOR CAR REPAIRS

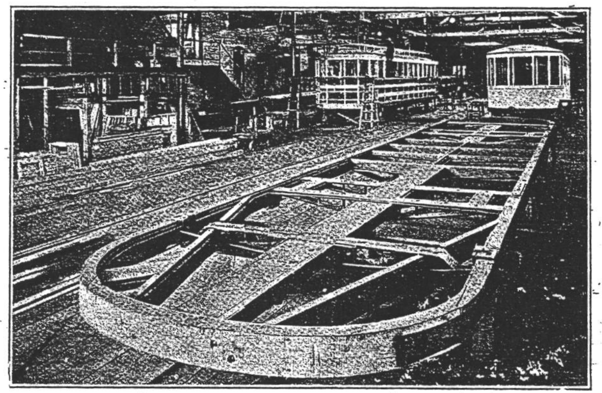
The double-truck cars are used for the regular service as much as possible with the single-truck in, all ready for rush hours and special occasions. The total double-truck mileage for 1901 was 7,031,957; the single-truck motor-car mileage was 4,497,536, and the trailer was 1,362,681, making a total car mileage of 12,892,174. All calculations are based on the total motor car mileage of 11,529,493. The reduction in amount paid for conductors' and motormens' wages for 1901 from 1900, due to increase in capacity of motor cars and decrease in use of trailers, is shown by the following:

	1901	1900	Per cent. decrease from yr. previous
Conductors' wages	$249,705.10	$260,685,79	4.21
Motormen's wages	238,206.59	241,583.15	1.40
Excess conductors to motormen.	$11,498.51	$19,102.64	39.81

The adoption of long double-truck cross-seat cars has had its effect on the earnings as well as reducing expenditures and doing away with the necessity of keeping a double equipment of car bodies for summer and winter. Whatever may be said in favor of the ordinary open car for warm pleasant weather, it is certainly not an ideal conveyance in rainy weather. There are also many occasions when the open cars are on the road in spring and fall and on cool evening, that this type is not comfortable The present cars can be converted from open to closed by simply raising the windows. Aside from the greater comfort and public preference for the long easy-riding double-truck cars, it has been found that, whereas the traffic formerly fell off on rainy days with open cars, it now increases. This shows that with the ordinary open cars the people who formerly walked short distances or did not venture out at all now take the cars in more than sufficient numbers to counteract the depressing effect of bad weather on the revenues. In the Minneapolis climate the desirability of having a car that is closed along the floor line on cool summer evenings, and that can be closed entirely during temporary cold weather, is not to be lightly estimated.

The dimension and construction of these cars will be clear from the photographs and drawings accompanying this article, some of the photographs having been taken during construction. An order of twenty-five new cars was going through the shop at the time these photographs were taken.

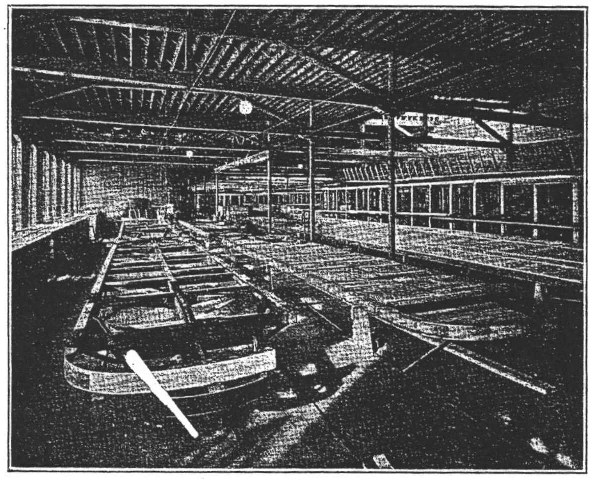
The floor timbers are reinforced by steel and the platform supports are channel iron run straight out for supporting the motorman's vestibule. The platform supports are 6-in. and 4-in. channel iron and bend down to bring the rear platform floor 5 ins. lower than the car floor. The motorman's vestibule is entered only by a small door on the right-hand side. A partition is run clear across the front end of the passenger compartment between the motorman's vestibule and the balance of the car. The cars are heated with Baker hot water heaters, and the heater is placed in the motorman's vestibule, it being part of the motorman's duties to keep fire in the heater. The cars are remarkably well warmed and are as comfortable, ordinarily, as any steam railroad coach. During the coldest weather double windows are put on, which, of course, greatly aid in keeping the cars warm. In summer the windows are taken out entirely and the same car used as an open car. A peculiar feature, and one that helps in keeping the cars warm, is that there is no opening of any kind in the floor of the car; further than this, it is of double thickness, a layer of cheap pine being put underneath the main hardwood floor. The floors are smooth without the usual grooves. The front part of the car has cross seats and the rear part side seats, to facilitate exit during the rush hours. To reach the rear platform three steps are required and another step of 5 ins. from the floor of the platform. The motorman can ordinarily keep his vestibule closed and warm, but to avoid opening windows to turn switches two very small trap-doors are put in the motorman's vestibule, through which he can put his switch hook to turn switches; it being, of course, necessary that he stop very nearly over the switch tongue.


FRAMING OF CAR FLOOR

These cars are all being built by the company in its extensive shops at Thirty-First Street and Nicollet Avenue, Minneapolis. The cost of these cars is admitted to be considerably more than what cars of equal capacity could be purchased for, but good workmanship and low repairs, rather than low first cost, are aimed at.

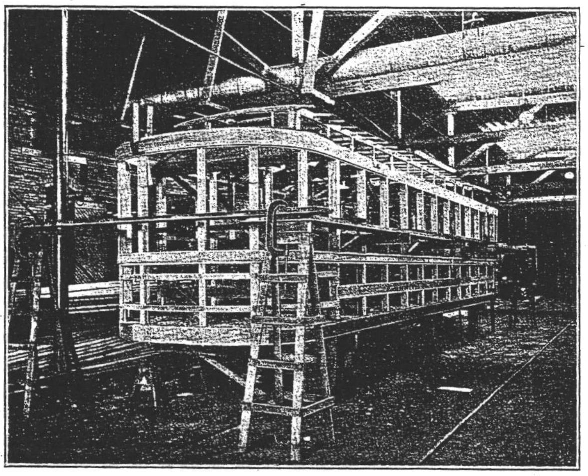
Some experiments have been made in splicing old cars together to make long cars, but the result was not satisfactory because of the narrowness of the old cars and the general lack of stability above the floor line.

The standard truck and motor equipment is Brill 27-A trucks on which are mounted four G. E.-67 motors. For suburban and interurban lines the same cars are used, but four G. E.-57 motors are put on to give the increased capacity required by the high speeds. The weight of one of these standard city cars with four G. E.-67 motors is 40,370 lbs. Interurban cars with air brakes weigh as high as 46,720 lbs.


REAR PLATFORM SUPPORTS

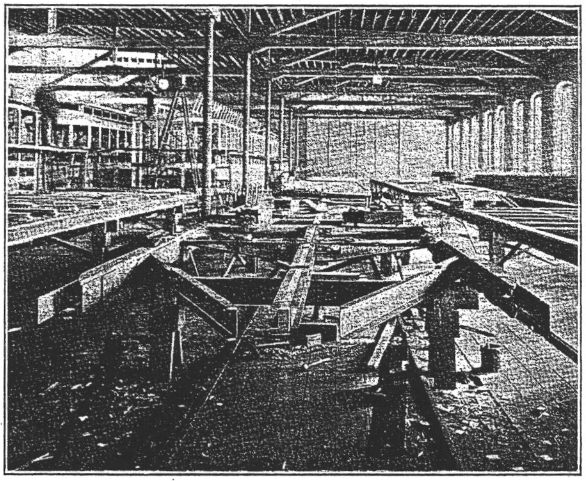
POWER CONSUMPTION AND MAINTENANCE DATA

The power used in car operation in kilowatt-hours per motor car mile for 1901, by months, is as follows:

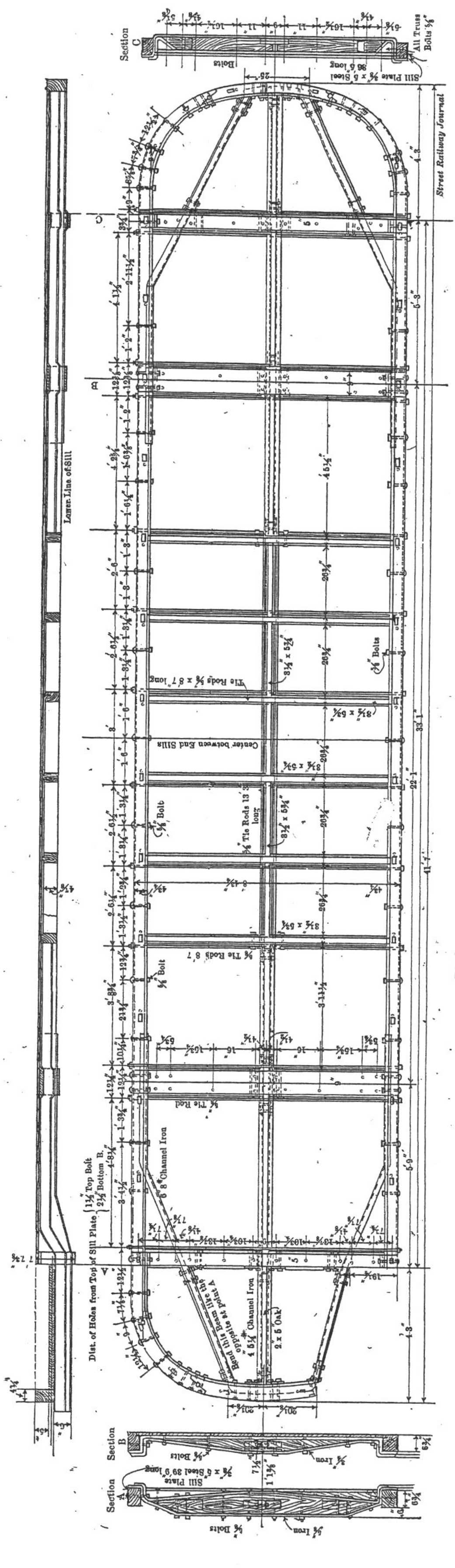

FRAMING OF CAR BODIES

	Kw hours		Kw hours
January	2.80	July	2.85
February	2.80	August	3.02
March	2.89	September	3.19
April	2.81	October	3.31
May	2.86	November	3.43
June	2.97	December	3.38

The relative mileage of single and double truck cars has already been given. These figures are from the alternating current switchboard of the water-power plant and the direct current switchboard of the steam plants. The greater part of the power being generated from water, a large percentage of these figures includes the losses in alternating current distribution and conversion as well as the losses in the direct current feeders. The average speed of cars on all divisions for the year was 8.45 miles per hour.


FRONT PLATFORM SUPPORTS

The company still has in use, at rush periods, some of the oldest motor equipments. Very complete records, of course, have been kept of the maintenance of the different kinds of motors. Table VI. gives the cost per motor mile for each of the five types of motors in use. In this table, column I., is the total cost of maintenance obtained by



FLOOR SPACE OF STANDARD DOUBLE-TRUCK CAR

dividing the cost of maintenance of each motor by the mileage of that motor. It should be remembered that all of the figures in this table are on the cost of individual motors, not for a car equipment of two or four motors.

TABLE VI.—MOTOR MAINTENANCE.

Type of Motor.	Col. I Total Cost per Motor Mile.	Col. II Cost in Armature Room.	Col. III Cost Armatures Alone
G. E. 67	$.0008	$.0002	$.0001
G. E. 57	.0014	.0006	.0002
W. P. 50	.0033	.0017	.0004
Sprague	.0039	.0015	.0008
S. R. G.	.0055	.0046	.0026
Average	$.0023	$.0011	$.0042

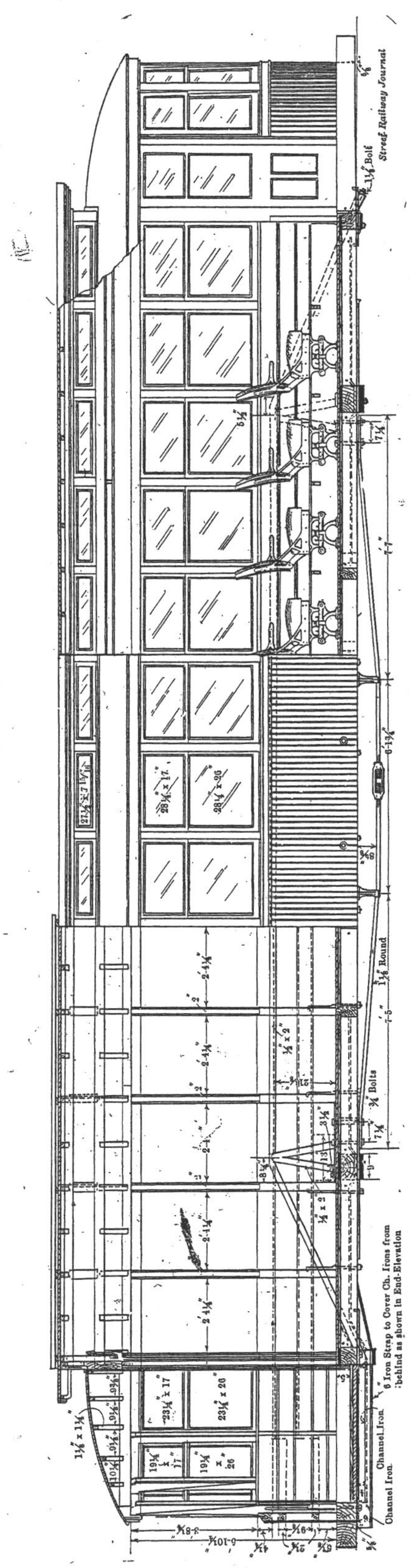
Column II. is the total cost for a motor mile of maintaining a motor taken from armature room reports. These figures include not only repairs to armatures but field coil repairs and any defect of an electrical nature which would cause a motor to be sent to the armature room.

Column III. is the cost per motor mile for armature repairs alone. The figures in column II. subtracted from those in column I. will, of course, be the cost of general repairs outside of the purely electrical ones. A report of this kind is of the greatest value in determining how long it will do to hang on to old equipment before throwing it away and buying new equipment which can be maintained more easily. Of course it must be remembered in this connection that the G. E.-57 and G. E.-67 motors are relatively new, as they are the motors with which all new cars built are being equipped. The S. R. G. repairs seem to be all out of proportion to the others. Looking back on the situation, one cannot help thinking that it is very fortunate that some wise man did not get hold of these comparative figures on Sprague and S. R. G. repairs in the early days when the single-reduction motor was first coming in to argue that the single-reduction motor was a mistake and a step in the wrong direction. Similar arguments are made to-day regarding apparatus which is right in principle and which marks an attempted advance over previous types, but which lacks perfection of details necessary to a successful competition with older apparatus.

POWER AND POWER PLANTS

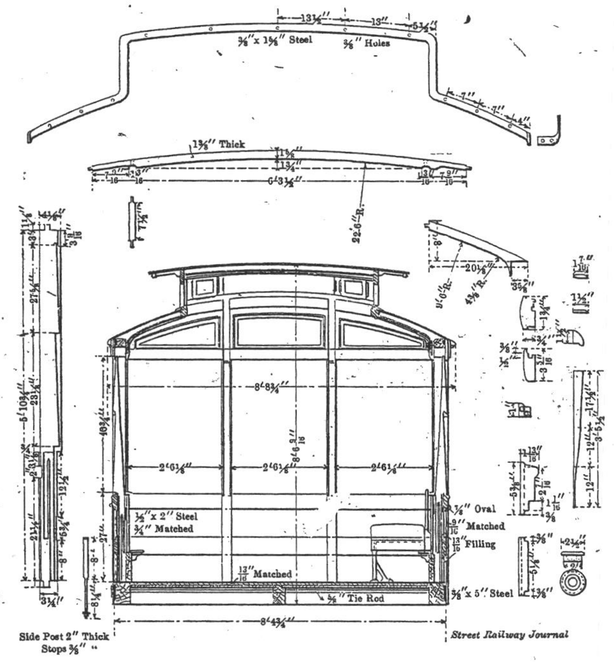
On account of the high price of coal in Minneapolis and St. Paul power has always been expensive when generated in a steam plant. For the past three years, however, a considerable portion of the power used has been generated by a water-power plant at St. Anthony Falls, in Minneapolis. This plant has been fully described in the STREET RAILWAY JOURNAL of May, 1898, and Aug. 11, 1900. It is owned by the Pillsbury-Washburn Company and leased by the street railway company, and a rental is paid based on the power available for use from day to day. Under the terms of the contract the street railway company pays for what power is actually being used by the water-wheels plus the horse-power of the water wasted over the crest of the dam. To determine the power used the recording wattmeters on each generator are read each hour, and the readings thus obtained reduced to horse-power with the efficiencies of the generators and turbines deducted are taken as the horse-power of the water passing through the turbines for that hour. The crest of the dam forms a weir by which the waste water can be measured. The average horse-power available is the figure upon which the rental is based.

Previous to the building of this plant, power was furnished by steam plants in St. Paul and Minneapolis. As


Street Railway Journal
1¼ Bolt
1⅜ Round
¾ Bolts
Channel Iron
Channel Iron
6 Iron Strap to Cover Ch. Irons from behind as shown in End-Elevation

ELEVATION, PARTLY IN SECTION, OF STANDARD DOUBLE-TRUCK CAR

the power supplied by the water-power plant has usually been a little short of that necessary to operate the system the old steam plants have had to supply the peaks of the load. Two steam plants are also maintained on the Stillwater line. The cost of steam-power has, of course, been high under such circumstances, as the steam plants have not been operated under the most advantageous conditions. An inspection of the costs of power per kilowatt-hour, from month to month, of course shows that this cost increases as the load on the steam plants decreases. Nevertheless the figure on total cost of power, including both water and steam power, averages low, and the cost of that part of the power furnished by steam is remarkably small considering the conditions.


⅜" x 1⅜" Steel
⅜" Holes
1⅜" Thick
22-6" R.
8'-8¾"
2'-6⅛"
⅜" x 2" Steel
¾" Matched
1 3/16" Matched
⅜" Tie Rod
8'-4¾"
¾" Oval
9/16" Matched
13/16" Filling
⅜" x 5" Steel
Side Post 2" Thick
Stops ⅜"
Street Railway Journal

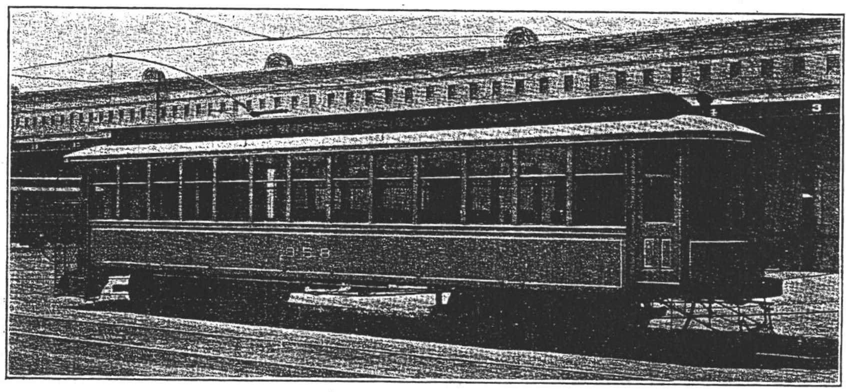
TRANSVERSE SECTION AND DETAILS OF STANDARD DOUBLE-TRUCK CAR

The cost of all power, both water and steam, for the year 1901 averaged $.0066 per kilowatt-hour. The cost of steam-power was $.0138 per kilowatt-hour and the cost of water-power $.0051. The cost of labor for water-power was about 10 per cent of the total.

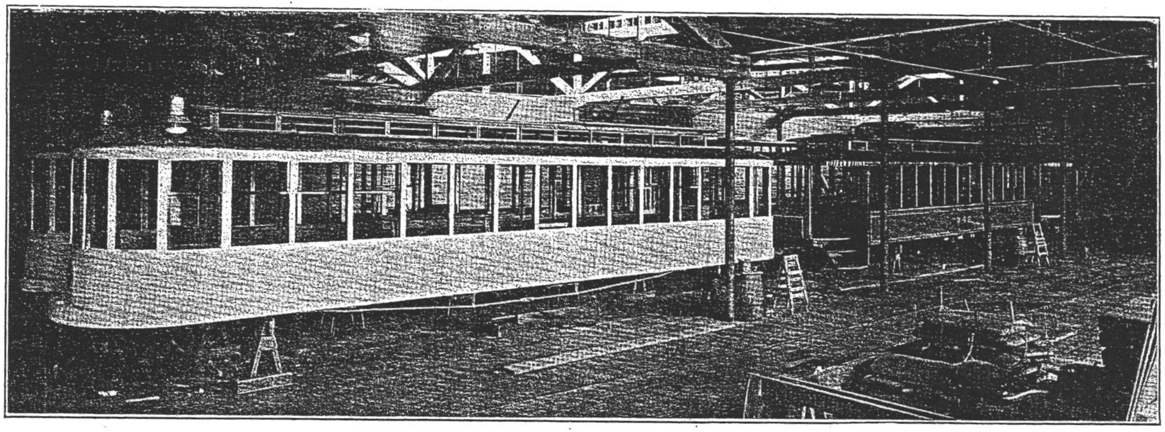
The water-power plant contains ten 1000hp. water-wheels. Eight are direct-connected to General Electric 3450-volt, three-phase generator. Two are direct-connected to direct-current 650-volt generators. The 3450-volt, three-phase current is taken to two sub-stations in Minneapolis. For transmission to St. Paul it is raised by step-up transformers to 12,000 volts and conducted by paper-insulated underground cables to two St. Paul substations.

This company, in common with the majority of other large street railway companies, is at present short of power during rush hours because of the great increase in travel, which has exceeded all expectations. The enlargement of power facilities is therefore being taken up on a comprehensive scale, and it has been decided to start the building of an alternating current generating plant adjoining the water-power plant at St. Anthony Falls. This plant will generate at 3450 volts, three-phase, and can be operated in parallel with the water plant, allowing the water-wheels to run with a constant full load and making the steam engines do the greater part of the regulation. A

3500-kw three-phase General Electric generator has been ordered, to be direct-connected to a vertical Reynolds-Corliss engine to be made by the Allis-Chalmers Company. This generator is of the revolving field fly-wheel type and the specifications require that it shall operate twenty-four hours at rated load with not more than 30 degs. C. rise above engine room temperature, and that at the close of such a test it will stand 50 per cent overload for 1 hour without more than 42½ degs. C. rise above engine room temperature, the construction being such that with an engine room temperature of 25 degs. the insulation will not be injured by the rise named. The Reynolds-Corliss engine to drive this generator will be compound condensing with cylinders 46 ins. and 94 ins. by 60-in. stroke, running 75 r. p. m. The building will be laid out to contain six units of this size with necessary boilers, though it can be extended indefinitely. Six Babcock & Wilcox boilers have been ordered with coils for superheating steam, and it is the expectation to superheat about 120 degs. Each boiler has 5500 sq. ft. of heating surface and is nominally rated at about 550 hp.



STANDARD CAR, TWIN CITY RAPID TRANSIT COMPANY



CARS IN PAINT SHOP

The location of the power house will make the fuel-handling problem easy. It is to be on the shore of the river immediately under the edge of a solid rock bluff. A railroad siding from the Minneapolis & Western Railway will be run along the edge of the bluff and coal unloaded into coal cars running around the boiler room roof and dumping into hoppers directly over the boilers. Sargent & Lundy, of Chicago, are consulting engineers for the new power plant, and F. S. Pearson, of New York, has also been called in consultation.

One interesting point in connection with the enlargement of power generating and distribution systems is that one sub-station will be put in each city instead of the two now maintained. While the direct-current proper required is greater with but one sub-station it is calculated that the saving in attendance and the reduction of fluctuations in load, together with the better opportunity for a given capacity of storage battery to take care of fluctuations, if located at one central point, more than compensate for this.

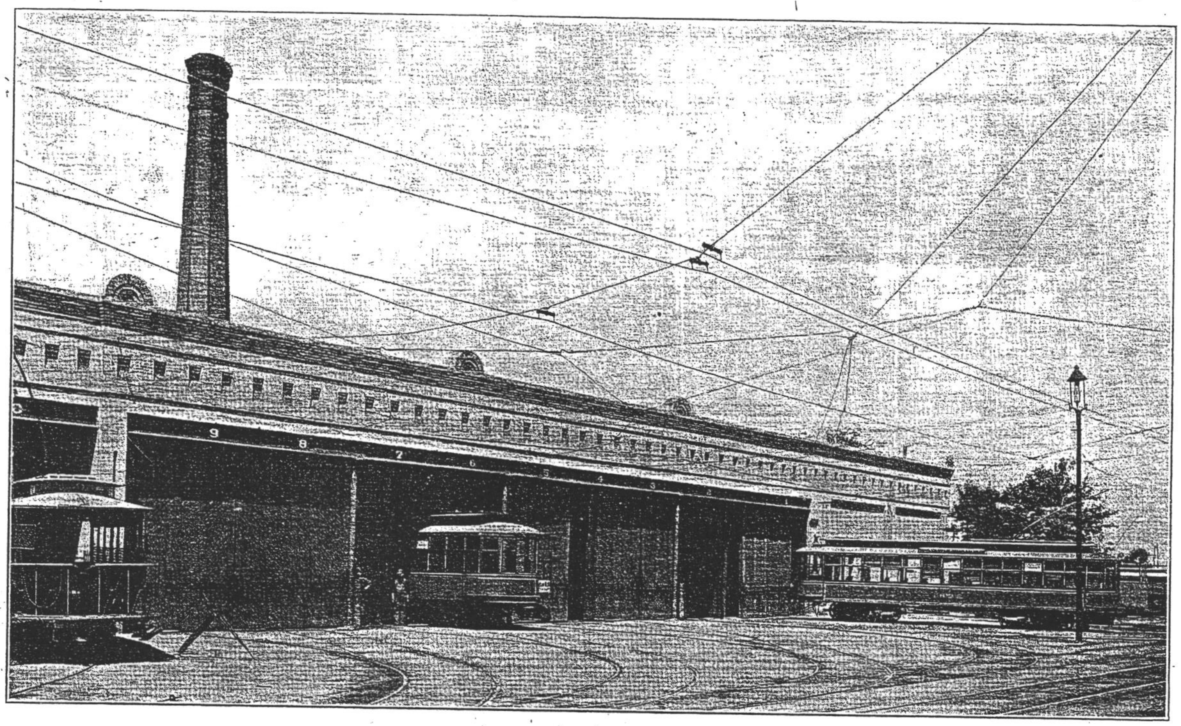
The present water-power plant has two sets of bus-bars. One of these sets will be extended into the new steam plant for connection in parallel with the steam-driven generators.

A neat method of calibrating all the instruments on the generator panels at the water-power plant is in use. The panels are so arranged that by removing the fuse blocks at the bottom of each the generator is disconnected from the panel. Disconnection from the bus-bars is also accomplished by opening the switches. Then with about twenty minutes' work, by means of flexible leads, the panels are all connected in series. One generator is then started up and furnishes current to a water rheostat through the series of eight alternating current switchboard panels. The load on the generator operating is adjusted to about that usually carried on each generator, and the errors on the various indicating and recording wattmeters are noticed, and allowance made by changing of constants for any changes that may have occurred. Each wattmeter is cleaned just before this test. The comparison is, of course, made with a standard wattmeter in series with the eight switchboard panels.

ACCIDENTS

In the matter of injuries and damages, the company is necessarily under greater expense than one operating over a less scattered territory. It is necessary to keep claim agent departments in both Minneapolis and St. Paul and this increases the expenses somewhat over what it would be if one claim department could attend to the entire system, but the latter is found to be impracticable on account of the local conditions, as St. Paul claim agents can deal better with St. Paul people and Minneapolis claim agents with Minneapolis people. That is, it is found to be a good policy to have claim agents identified with the local interests of the cities in which they work because, as is generally known, there has been considerable rivalry between these two cities in the past. However this may be, it will be seen from Table II. that there has been a marked decrease in the percentage of cost of injuries and damages to the gross earnings; this is due to greater care on the part of trainmen and skill in handling the damage cases, and a large slice was also cut off the amount paid for damages at the time what is known as "the Minneapolis gate" was put on nearly all the cars.

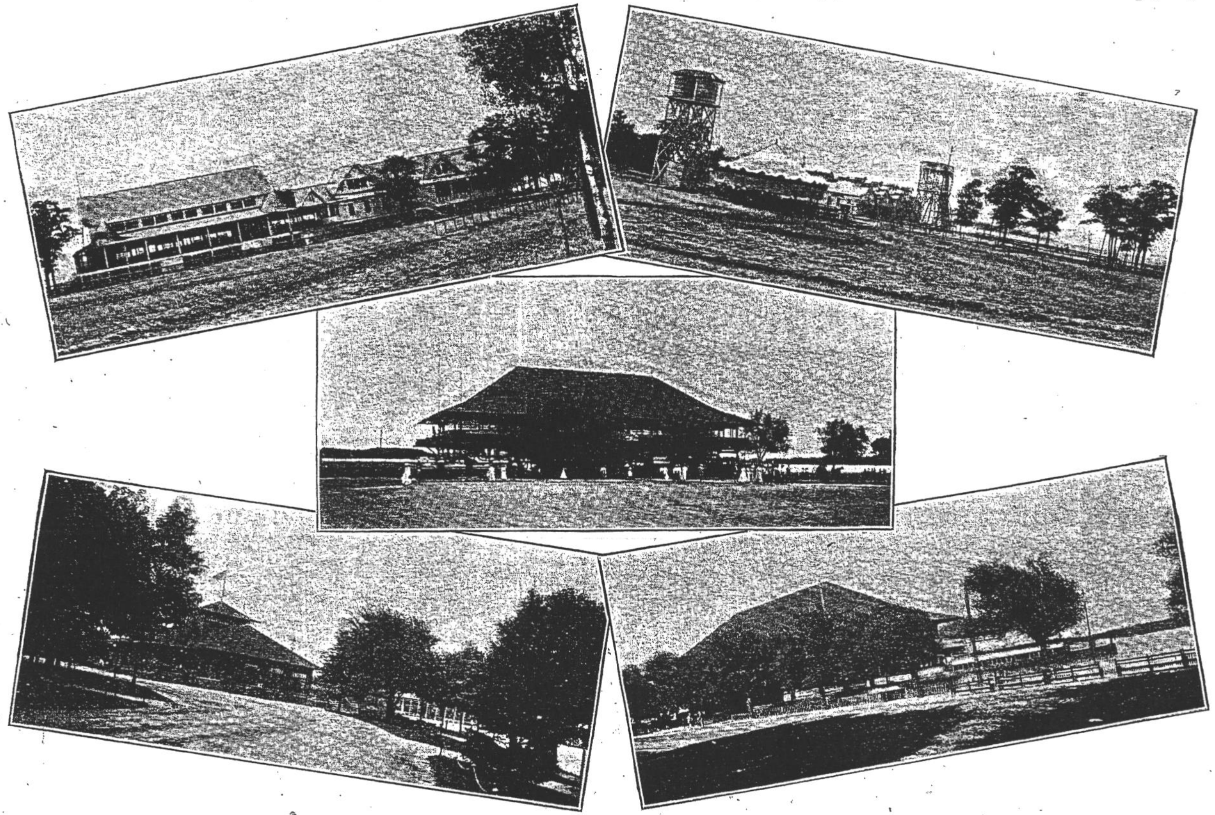
The time this change came is very evident in Table II., where the injuries and damages dropped from $160,813 in 1894 to $80,890 in 1895 and $65,587 in 1896, there being no great change in the gross earnings in these three years. The Minneapolis gate, which is probably known to most street railway men over the country, having since been adopted on the Metropolitan Street Railway at Kansas City, is a gate opened and closed by the motorman, the idea being that the car shall be closed against entry or exit at all times except when at a dead standstill. The motormen have orders to open the gates only when cars are standing still. At all other times they are closed. The gates open outwardly and are controlled by a system of rods and levers running from the motorman's vestibule to the rear platform. At the time the gates were adopted, an inspection of the accident account revealed that a considerable percentage of the costly injuries were due to passengers attempting to leave or board the car while the car was in motion. While these accidents were, strictly speaking, not accidents for which the company was responsible, the claim is usually set up in such cases that the motorman started the car just as the injured person was stepping off and that the conductor gave the starting signal too soon. Such cases form an uncomfortably large percentage of the total number of cases. The adoption of gates which are closed at all times except when the car is standing, has immediately shut off a great bulk of this class of accidents. There are a few stop accidents at the present time, however, as an inspection of the accident statistics shows, and the experience at Minneapolis would seem to demonstrate that where gates of this kind are used special precaution should be taken to see that motormen do not fall into the bad habit of starting the car before the gates are closed, otherwise more serious accidents than those that the gates are intended to prevent may happen. There is, of course, a constant temptation for the motorman to turn on the current before closing the gates in order to save a fraction of a second in time for each start; while this saving of time may be desirable, it would seem that it is hardly worth the risk involved, especially with an outwardly opening gate which can catch alighting passengers. Many questions have been asked, from time to time, as to how the use of gates in Minneapolis affected the schedule speed. Many managers have asserted that the scheme is entirely impracticable in their cities because there are a large number of men who will get off the car before it stops and allow it to proceed before coming to a full stop, thereby saving time for the car and allowing a higher schedule speed than could otherwise be made. Experience in Minneapolis does not seem to bear this out. Vice-President Goodrich states that the use of gates not only does not decrease the schedule speed, but allows better time to be made. This, he says, is because the motormen bring their cars promptly to a standstill when they must stop at a crossing rather than bringing them up to a crossing at a low rate of speed expecting that they may possibly not have to come to a stand. It is a custom among some motormen and conductors for the conductor to give a late bell when an active-looking man is to get off, with the expectation that the motorman will not have to bring the car to a dead standstill. In such a case the motorman will reduce his speed considerably and drift along, expecting to get a go-ahead signal about the time he reaches the crossing. If he does not get it, he may drift along a few feet farther and then stop the car, which wastes more time than had he made a prompt stop. At least this is the theory by which the rapid schedule time made by cars equipped with gates is accounted for.



THIRTY-FIRST STREET CAR HOUSE

Figures on accidents on all divisions of the Twin City Rapid Transit Company for 1901 were as follows:

Passengers carried	63,009,957
Passengers per accident	20,003
Cost of accidents per passenger	$.0020
Total motor car miles	11,529,453
Motor car miles per accident	3,660



VIEWS IN PARKS OF THE TWIN CITY RAPID TRANSIT COMPANY

These are also approximately the proportions on the interurban lines which are included in the above averages, except that on all divisions the cost of collisions was about 50 per cent of the total cost of accidents, and of this 50 per cent one-half is chargeable to the interurban line between St. Paul and Minneapolis—a figure which it is hoped to reduce by the use of air brakes on the interurban cars. On the Minneapolis & St. Paul Suburban Railway, which is an interurban line from St. Paul to Stillwater, 20 miles, the accident figures for 1901 were as follows:

Passengers carried	3,322,044
Passengers per accident	28,018
Cost per passenger	$.0008
Motor car miles	650,289
Motor car miles per accident	4,655

OPERATING FIGURES OF THE ST. PAUL-STILLWATER INTERURBAN LINE

Reliable figures on the operation of interurban electric roads are of special value in these days when there is such great activity in the building of such roads and when it is often hard to get figures based on conservative and experienced management.

The line from St. Paul to Stillwater is 20 miles in length. It is divided into six sections, a charge of 5 cents being made for each section, or 30 cents for the entire trip from St. Paul to Stillwater.

The following are the figures on operation for 1900, those for 1901 not having been completely tabulated at present writing. A half-hour service is given on this line the year round, but a heavy summer business is done taking people to Wildwood. The average number of cars in operation per day of eighteen hours was 5, and the car mileage was 602,269.

	Per car mile
Passenger earnings	$.2242
Miscellaneous earnings	.0024
Total gross earnings	$ 2266
Maintenance, way and structures	$.0051
" equipment	.0133
Operation of power plant	.0403
" " cars	.0386
General expense	.0175
Legal "	.0017
Injuries and damages	.0059
Insurance	.0014
Total cost operating per motor car mile	$.1238

PLEASURE RESORTS

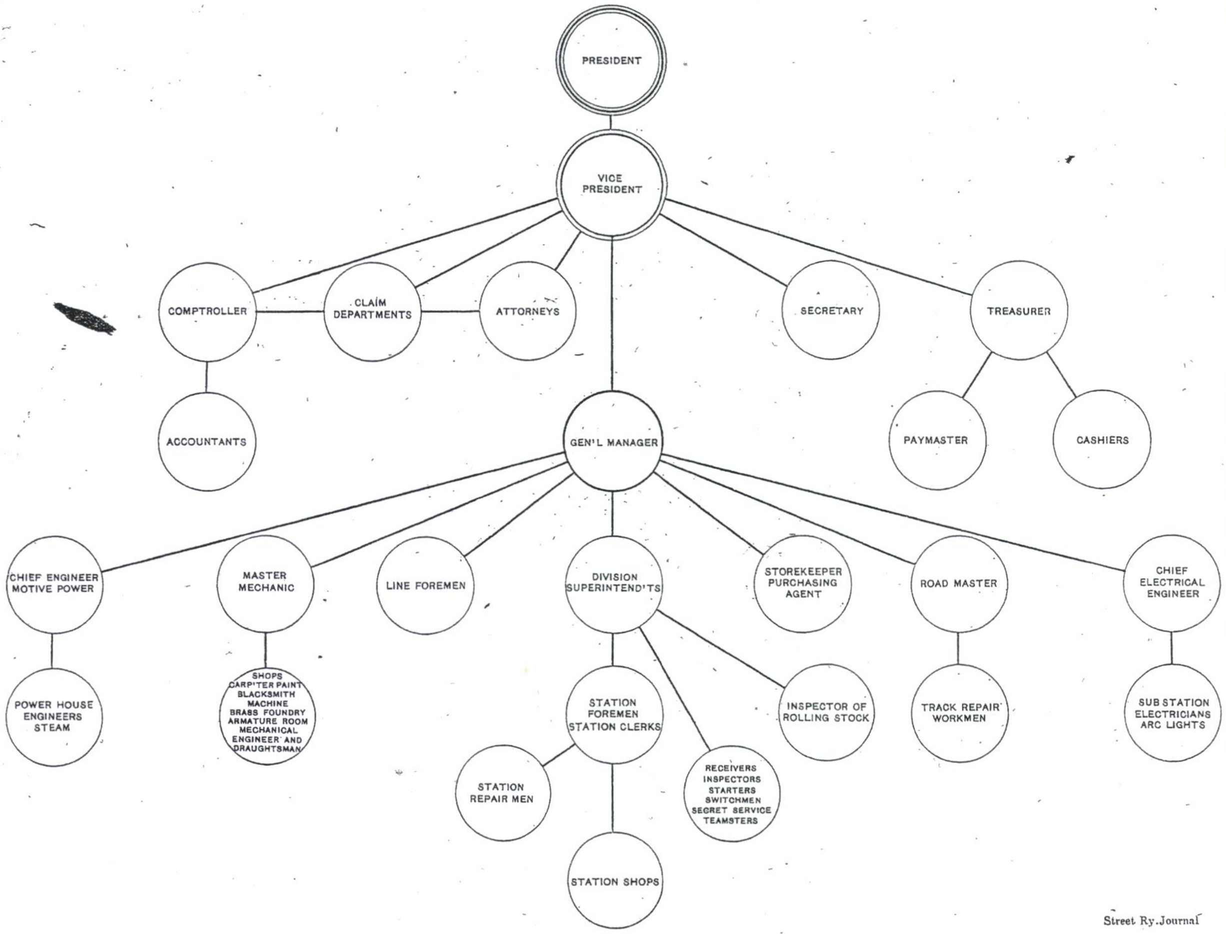
There are three large resorts on the Twin City Rapid Transit Company's system. Two of these are parks maintained by the park commissioners, and one of them a resort maintained by the company. In Minneapolis Lake Harriett is the great amusement center, and is located on the southwestern edge of the city. Como Park and Lake, in St. Paul, is located on one of the interurban lines between the two cities, and on account of its convenient location gets many pleasure-seekers. Wildwood, on the St. Paul and Stillwater interurban line at White Bear Lake, is maintained and operated entirely by the company. At Wildwood which was formerly a rather tough resort, a transformation has taken place since this company took hold of it, and it is now maintained along the same lines that the public parks of Minneapolis and St. Paul are kept by the park commissioners. No objectionable people are allowed on the grounds, and the resort is as suitable for ladies and children as are any of the public parks. There are, of course, however, more miscellaneous attractions, such as merry-go-rounds, bowling alleys, switchback railways, etc., t Wildwood than at the public parks. At the Como and Harriett resorts expensive bands are engaged each season, the cost of such bands sometimes running as high as $2,000 a week. When such bands play at the public parks, a bonus is usually obtained from the park commission to cover part of the expense. The company keeps its accounts in connection with parks and pleasure resorts just as it would if it were an outside party running these places. All expenses, car fare of bands, etc., are charged as if paid for in cash.

At Wildwood large bath houses have been built, and an antiseptic laundry for quick washing and drying of bathing suits. The admission to the amusement hall at this place is 10 cents. Bowling alleys cost 30 cents per game.

ORGANIZATION

As seen from the accompanying chart of organization the vice-president is the hub about which the various departments center. The general manager has charge of everything pertaining to operation or equipment. The claim department is not put under operation, as it is considered that a better compromise between operating expediency and legal policy on various matters can be obtained by having operation and claim departments separate, and reporting independently to the vice-president, who can decide points of policy in connection with the claim department after considering all sides of the question.

As said before, the principal officers of the company have been the same for the past nine years: Thomas Lowry, president; C. G. Goodrich, vice-president, secretary and treasurer; J. F. Calderwood, auditor; W. J. Hield, general manager. The other officers and department heads are: R. L. Costigan, purchasing agent; G. Brigger, superintendent Minneapolis division; D. S. Smith, superintendent St. Paul division; R. C. Taylor, master mechanic; Edward Scofield, electrical engineer.


PRESIDENT
VICE PRESIDENT
COMPTROLLER
CLAIM DEPARTMENTS
ATTORNEYS
SECRETARY
TREASURER
ACCOUNTANTS
GEN'L MANAGER
PAYMASTER
CASHIERS
CHIEF ENGINEER MOTIVE POWER
MASTER MECHANIC
LINE FOREMEN
DIVISION SUPERINTEND'TS
STOREKEEPER PURCHASING AGENT
ROAD MASTER
CHIEF ELECTRICAL ENGINEER
POWER HOUSE ENGINEERS STEAM
SHOPS CARP'TER PAINT BLACKSMITH MACHINE BRASS FOUNDRY ARMATURE ROOM MECHANICAL ENGINEER AND DRAUGHTSMAN
STATION FOREMEN STATION CLERKS
INSPECTOR OF ROLLING STOCK
TRACK REPAIR WORKMEN
SUB STATION ELECTRICIANS ARC LIGHTS
STATION REPAIR MEN
RECEIVERS INSPECTORS STARTERS SWITCHMEN SECRET SERVICE TEAMSTERS
STATION SHOPS

Street Ry. Journal

DIAGRAM OF ORGANIZATION, TWIN CITY RAPID TRANSIT COMPANY

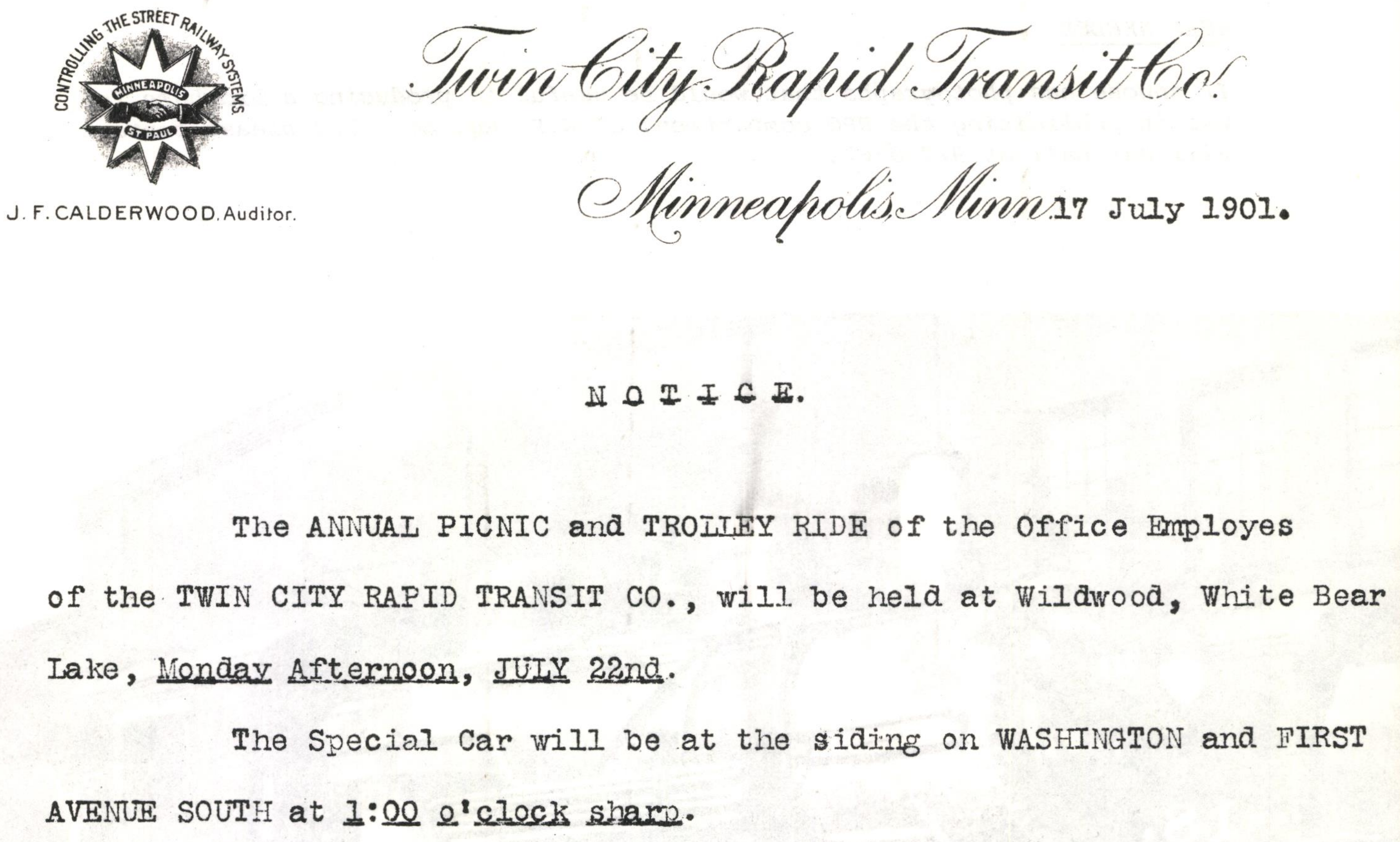
There is always an interesting question in connection with pleasure resorts, as to whether the company is running ahead or behind in maintaining them. After keeping its expense accounts according to the method above outlined, this company, during the summer season of 1901, found that its pleasure resorts had cost it $4,292.24 over and above all money received from concessions and bonuses from the park commissioners. This is such an insignificant figure in comparison with the amount of business done in carrying people to these pleasure resorts that there is no doubt as to the money expended on these places by the company being well spent. At Wildwood, traffic, of course, could be kept with a reasonable degree of accuracy. The deficit at Wildwood in 1901 was $1,265.27. The traffic at Wildwood during the summer season of 1901 was as follows, carried out in dollars and cents:

June	$7,496.27
July	12,676.18
August	13,299.52
September	6,896.83
Total	$40,368.08

◆

During the storm of Feb. 17 a larger amount of snow fell in many districts in the East than in any other storm during the last twelve years. Yet, though the service on some roads was impeded, it was not more so than on neighboring steam railroads.

CONTROLLING THE STREET RAILWAY SYSTEMS.
MINNEAPOLIS
ST. PAUL



CONTROLLING THE STREET RAILWAY SYSTEMS.
MINNEAPOLIS
ST. PAUL

J. F. CALDERWOOD. Auditor.

Twin City Rapid Transit Co.

Minneapolis, Minn. 17 July 1901.

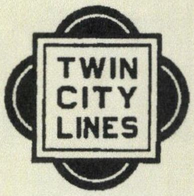
NOTICE.

The ANNUAL PICNIC and TROLLEY RIDE of the Office Employes of the TWIN CITY RAPID TRANSIT CO., will be held at Wildwood, White Bear Lake, Monday Afternoon, JULY 22nd.

The Special Car will be at the siding on WASHINGTON and FIRST AVENUE SOUTH at 1:00 o'clock sharp.

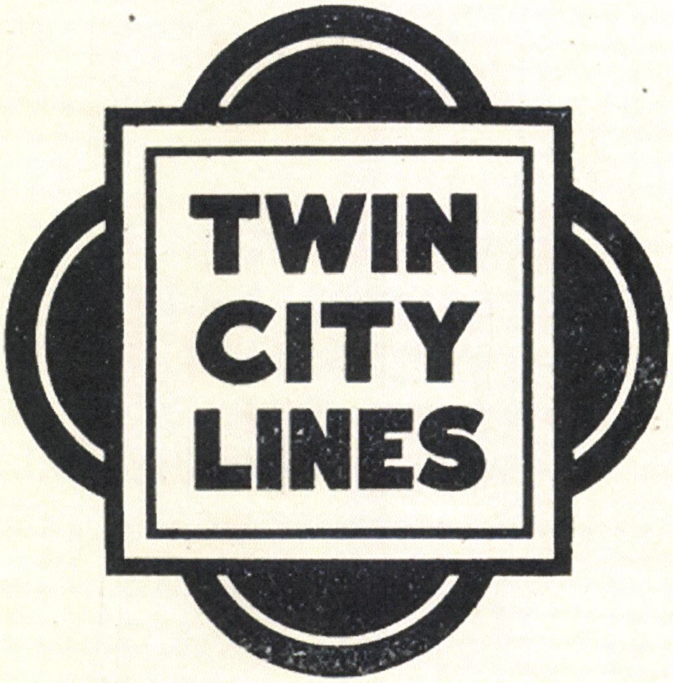
ELEC. RY. REVIEW 2-2-1907

The Twin City Rapid Transit Company, of Minneapolis, Minn., controls and operates the city and suburban street railway lines of Minneapolis and St. Paul, as well as a line of steamboats on Lake Minnetonka. The passenger department of the company has been seeking for some time for a suitable trademark for the system and after examining a great many different designs has finally adopted the one shown in our engraving. This trademark will hereafter be used on all printed matter, blanks, timetables, newspaper advertising and other forms of publicity. It was selected from a large number because of its simplicity and because it would look equally well in all sizes and whether printed in one or more colors. The design represents a Spanish mission window, which is typical of the style of architecture to be used in the company's amusement resort at Big Island Park, on which work is now under way.



TRADE MARK AT MINNEAPOLIS

The general passenger department of the Twin City Rapid Transit Company, of Minneapolis and St. Paul, has just announced the adoption by the officials of a trade mark which will hereafter be seen on all printed matter, blanks, time tables, newspaper advertising and other forms of publicity the company will issue.



TRADE-MARK JUST ADOPTED BY THE TWIN CITY RAPID TRANSIT COMPANY

Practically every steam road and steamship line in the country is distinguished by its trade mark, and the prominent electric lines are falling into line in this respect. The Twin City Rapid Transit Company, appreciating the advertising advantages of such a symbol, started some weeks ago to secure a design for a trade mark. Looking over the wide range of trade marks the company discovered that nearly every geometrical form had been appropriated, circles, squares, ovals, shields, diamonds, flags, banners and the whole family of patterns that lent themselves readily to an attractive mark. Many suggestions were offered for complicated designs which meant much study, for pictures of cars and tracks, of "Minnie" and "Paul" and a host of other ideas serious and silly. A good trade mark seemed to be defined as a striking design that would look equally well if printed as small as a dime or as large as the top of a barrel, a design that would look well if printed in one color or two

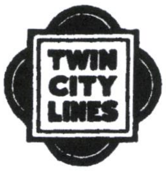
SRJ JANUARY 5, 1907

ETW —— 1-3-1907

TRADE MARK FOR TWIN CITY LINES

Most of the important steam railroad and steamship lines of the country have adopted distinguishing trade marks and the prominent electric railway lines are gradually following suit in this respect. The latest of the electric traction companies to adopt a trade mark is the Twin City Rapid Transit Company of Minneapolis and St. Paul. The passenger department of this company announces the selection of the design which is reproduced in this connection and which will hereafter appear on all printed matter, blanks, timetables, newspaper advertising and other forms of publicity used by the company.

The design selected represents a Spanish mission window which is typical of the Spanish mission architecture to be employed in all the company's beautiful buildings at Big Island park. For the most part the design will always appear in two colors.



Trade Mark Adopted by Twin City Rapid Transit Company

The words "Twin City Lines" include all the Twin City Rapid Transit properties, local lines, suburban lines, and steamboat lines in the same broad way as "New York Central Lines" and "Pennsylvania Lines" include the many rail and boat properties of those corporations.

In considering suggestions for the design a good trade mark was defined as a striking design that would look equally well if printed as small as a dime or as large as the top of a barrel; a design that would look well if printed in one color or two colors; something that told its story at one glance and was yet so simple as to be remembered and admit of being drawn from memory by those who saw it.

A company brochure published in early 1928 for financial purposes provided a comprehensive guide to the corporate structure and related physical facilities. The major features are summarized following.

Minneapolis Street Railway Co.

Owned and/or operated

1. The entire street railway system within the corporate limits of the City of Minneapolis: 237.492 miles of track (excluding the Harriet Right-of-Way which was owned by the M&StP Suburban Railroad); plus the Fort Snelling line comprising 4.453 miles of track from 54th St. to the Mississippi River, all located on the U. S. Government Reservation, making a total of 241.945 miles of track. 181 miles of track were on paved streets. MSR operated the Columbia Heights line which was owned by the M&StP Suburban Railroad.

2. Seventeen parcels of land on which were situated the carhouse, office, power station and substation buildings.

3. Power distribution and transmission system consisting of overhead trolley wire with iron poles, feeder lines, underground conduit and transmission lines.

4. Forty-three buildings comprising the general office building, power and substation buildings, carhouses and miscellaneous buildings.

5. Steam turbine power station of 75,000 KW capacity supplying power for the operation of the Minneapolis and St.Paul and Suburban systems, augmented by purchase of water power from the St. Anthony Falls Water Power Co. generated from the Lower Dam Water Power Station and Hennepin Island Water Power Station.

6. Six rotary converter substations.

St. Paul City Railway Co.

Owned and/or operated

1. The entire street railway system located within the corporate limits of the City of St.Paul: 171.234 miles of track. Operated the South St.Paul line owned by the M&StP Suburban Railroad; operated the line owned by the same company on E. 7th St. from Duluth Ave. to the city limits.

2. The Selby Tunnel and seven parcels of land on which were located the general office, carhouse, substation and shop buildings.

3. Power distribution and transmission system consisting of overhead trolley wire (supported mostly by iron poles), feeder lines, underground conduit with transmission and distribution cables.

4. Four rotary converter substations with a total capacity of 20,400 KW. All primary power was supplied by the Mpls. St. Ry. and the St.Anthony Falls Water Power Co.

5. Thirty-seven office, shop, substation, carhouse and miscellaneous buildings.

6. Shop machinery and tools.

Minneapolis & St.Paul Suburban Railroad Co.

Owned and operated 91.352 miles of track located largely on private right-of-way. There were three principal divisions.

1. Minnetonka Division: 43.099 miles of track comprising the Lake Minnetonka line, which included the Harriet Right-of-Way (5.859 miles of track) extending from the east line of Hennepin Ave. and 31st St. to the westerly city limits at 44th St. and France Ave. S.

2. Stillwater Division: 33.980 miles of track, consisting of the (a) Stillwater line, 27.719 miles of track, including 5.09 miles of track on E. 7th St. from Duluth Ave. to the city limits; (b) White Bear line, 4.466 miles of track; and (c) Mahtomedi line, 1.795 miles of track.

3. Local Suburban Division: 14.273 miles of track, consisting of (a) Columbia Heights line, 1.544 miles of track, from 37th Ave. N.E. and Central Ave. to 40th Ave. N.E. and 5th St.; (b) Robbinsdale line, 1.846 miles of track, from the city limits at Xerxes Ave. N. and Broadway to Robbinsdale; (c) St.Louis Park line, 2.103 miles of track, from the city limits at W. Lake St. and France Ave. to St. Louis Park; and (d) South St.Paul line, 8.780 miles of track.

These were all high-speed lines of the most modern construction with large quantities of grading work. Bridges, viaducts, subways and culverts were quite extensive and track was well ballasted. All primary power was purchased from the Mpls. St. Ry. at (1) Minnetonka Division: two main substations, Hopkins and Excelsior, and one terminal substation, on the Harriet R/W west of Upton Ave., and (2) Stillwater Division: two main substations, Wildwood and Owen St., and one terminal substation, Wildwood.

Minnetonka & White Bear Navigation Co.

As all steamboat operations on Lake Minnetonka had ceased by 1928, this company owned only property. (1) At Lake Minnetonka, consisting of land, buildings and equipment, part of which were leased to the owners of the Excelsior Amusement Park. (2) At White Bear Lake, consisting primarily of land, buildings and equipment known as the Wildwood Amusement Park.

Corporate History
Bus and Trolley News

Dec 1939: TCRT of Minnesota to replace TCRT of New Jersey. In 1891 Minnesota corporation laws were unfavorable: stockholders were subject to double liability for losses. That regulation was stricken in 1931. In 1937 a law was passed to permit the merger of a Minnesota corporation with a corporation of another state. That cleared the last obstacle. 3,600 stockholders to vote on the change December 6th.

RAPID TRANSIT REAL ESTATE CORPORATION

This is a brief summarization of the real estate transactions taken from the accounting and real estate records.

Real Estate conveyed in the 12-31-1910 re-organization.

North 1/2 of the East 1/2 Lot 47, Village of Excelsior, lying north of the M&StL Ry. right-of-way at 3rd and Center Streets. (5251 sq. ft.) Contained two cottages occupied by the Lake Minnetonka Division dispatchers from May 20th through September 10th each year. Still owned as of 12-31-1925. Disposition and date not recorded.

Lot 34, except the north 40 feet, Brentwood, Excelsior Township. This was adjacent to the Tonka Bay branch line right-of-way on the north. Sold September 1917.

Lot 9, except the north 40 feet, Wildhurst, including all buildings and improvements, then in the name of Willard J. Hield. The north 40 feet was the walkway from the Wildhurst Loop to the Wildhurst Dock. Sold 1919.

Part of Lot 1 and all of Lots 2 through 7, Block 23, North St.Paul Proper. (115,824 sq. ft.) Still owned as of 12-31-1925. Disposition and date not recorded.

Also part of Lot 1 in North St.Paul Land Company Re-arrangement in Block 1, North St.Paul Proper. Not listed as of 12-31-1925. Disposition and date not recorded.

Land adjacent to Wildwood Park. The 1910 agreement described two areas, 38.6 and 18.8 acres respectively, 57.4 acres total. The Drum & Company Valuation Report as of 12-31-1925 calculated this area at 56.397 acres as follows.

Section 30, Township 30 North, Range 21 West:	
---Part of Government Lot 1 lying south of the right-of-way	6.494 acres
---North 120 feet of the SE 1/4 of SE 1/4	3.603 acres
Section 29, Township 30 North, Range 21 West:	
---Part of Government Lot 1 lying south of the White Bear right-of-way and west of the Stillwater right-of-way	1.364 acres
---Part of the SW 1/4 of the SW 1/4 lying west of the right-of-way except the public highway	6.065 acres
---Part of the SW 1/4 of the SW 1/4 of the SW 1/4 lying east of the right-of-way except the public highway	28.780 acres
---Part of Government Lot 3 lying south of the Powerhouse site and east of the right-of-way except the public highway	9.003 acres
---North of Wildwood Park: part of Government Lot 2; a strip of land 50 ft. wide extending from White Bear Lake on the west to the Mahtomedi right-of-way	1.088 acres

No dispositions or dates recorded.

Part of Lot 7, Town of East Shore, Washington County. Sold June 1912.

The old Stillwater Electric St. Ry. steam powerhouse property in Stillwater. Sold June 1912.

Subsequent Purchases

Como Gravel Pit, St. Paul. 10 1/2 lots were purchased September 1906 by SPCR. 6 1/2 lots were sold to the State of Minnesota July 1914 and the remaining four lots deeded to RTRE Corp. May 1924. Twenty-eight additional lots purchased by SPCR August 1908 were also deeded to RTRE Corp. May 1924. An additional 40 lots were purchased directly by RTRE Corp. in 1913. A description of the real estate as of October 1922 was as follows.

- St. Anthony Park Addition
  - Block 1, Lots 4-7; Block 2, Lots 4-7.
- Wynne's Addition

Block 2, Lots 1-30.
Long's Addition
Block 2, Lots 1-13 and 16-30.

The J. L. Shiely Company purchased a portion of the property in 1951. The remainder was sold in 1954 to the Mid-Continent Development & Construction Co.

South St.Paul Sand Pit, South St.Paul. Purchased by the Mpls. & St.Paul Suburban Railroad in 1910 and deeded to the RTRE Corp. in 1915. Sold 1928.

Government Lot 2, Sec. 29, Twp. 30, Rg. 21, on White Bear Lake, purchased in 1914. Disposition and date not recorded.

Twenty-three lots in five blocks of the Fifth Addition, North St.Paul. All were adjacent to the right-of-way where it entered North St.Paul. The descriptions contained in the Drum & Company Valuation Report as of 12-31-1925 were as follows. Section 14, Township 29 North, Range 22 West.

---Lots 32-33, Block 33 (124 x 80)	9920 sq. ft.
---Lot 1 and E 1/2 of Lot 2, Block 33 (124 x 60)	7440 sq. ft.
---East 20 ft. of Lot 16, all of Lot 17, Block 28 (83 x 60)	4980 sq. ft.
---Part of Lots 2 thru 6, Block 28 (lying east of a line drawn 60 ft. west of and parallel to the west line of Block 28)	5850 sq. ft.
---Lot 1, Block 28	3088 sq. ft.
---East 1/2 of Lot 29 and all of Lot 30, Block 24	3600 sq. ft.
---East 1/2 of Lot 2 and all of Lot 1, Block 24	7440 sq. ft.
---Lot 2, East 1/2 of Lot 29, all of Lot 30, Block 17	12400 sq. ft.
---Lot 1, Block 17	4960 sq. ft.
---Lots 29-30, Block 14	9920 sq. ft.
---Lots 1-2, Block 14	9920 sq. ft

Dispositions and dates not recorded.

Six lots in five blocks of the Sylvan Park Addition, St.Paul, purchased in 1919. This Addition was bounded by St. Clair Ave., Pascal St., Randolph Ave., and the alley west of Saratoga St. A house was built on each lot during 1919 for the "Employee Homes Project". These were subsequently resold to company employees: one each in 1921 and 1922, and four in 1923. A small financial loss was incurred on the entire program.

Lot 11, Block 26, Windom's Addition, Minneapolis, purchased September 1923. This was adjacent on the north to the Girard Substation. A wye was built on this lot in 1923.

The Terminal Block, Minneapolis, which was the entire block bounded by 2nd Ave. S., 7th St. S., Marquette Ave. S., and 8th St. S. Purchased June 1915 from the W. L. Harris Realty Company for $1,100,000. It was intended to build a seven-track terminal station where all Minneapolis lines would run through or terminate. After much correspondence with tenants of the existing buildings, and much intracompany memos as well, pertaining to rent collection and utility meter readings, the W. L. Badger Company was hired as the property and rental manager January 1, 1916. TCRT Co. was accused by the city of buying the property from hidden profits and no construction was ever undertaken. The corner at 2nd Ave. S. and 8th St. S. was sold 6-1-1923 to the Business Women's Club. During 1924 several smaller parcels were sold. The remainder of the property was sold 10-29-1925 to the Intersection Holding Company for $1,000,000 ($400,000 cash and $600,000 contract for deed). This was the site on which the Baker Building was later constructed.

PURCHASED 6-11-1915

CASH	$725,000
MORTGAGE	$375,000
TOTAL	$1,100,000

COST OF SAND AND GRAVEL PIT PROPERTY

GRAVEL PIT FAIR GROUNDS LANGFORD

					In Name of
LONG'S ADDITION					
Bought	4/13	Lots 1 to 8 and 23 to 28 Blk 2 (These lots taken in exchange for lots valued at $3,125.00 in Bazille's Addn plus $500.00 Cash)		3,625.00	Real Estate Co.
"	3/13	Lots 29 and 30 Block 2 - -		325.00	" " "
"	8/08	" 9 to 13 and 16 to 22, Block 2 - -		2,100.00	St Paul City Ry
WYNN'S ADDITION					
Bought	8/08	" 8 to 10 and 11 to 15 Block 2 -			
"	8/08	" 16 to 23 " 2 -		2,950.00	" " " "
	8/13	" 1 to 7 and 24 to 30 Block 2 -		3,100.00	Real Estate Co.
ST ANTHONY PARK					
	6/06	" 4,5,6,7 Block 1			
	6/06	" 3 to E ½ of 9 Block 2	1,200.00		
		Less Sold			
	7/14	" 3 Block 2,)			
	7/14	" 8 and 9, Block 2)	500.00	700.00	St Paul City Ry
		TOTAL COST LANGFORD GRAVEL PIT - -		12,800.00	

SAND PIT SOUTH ST. PAUL

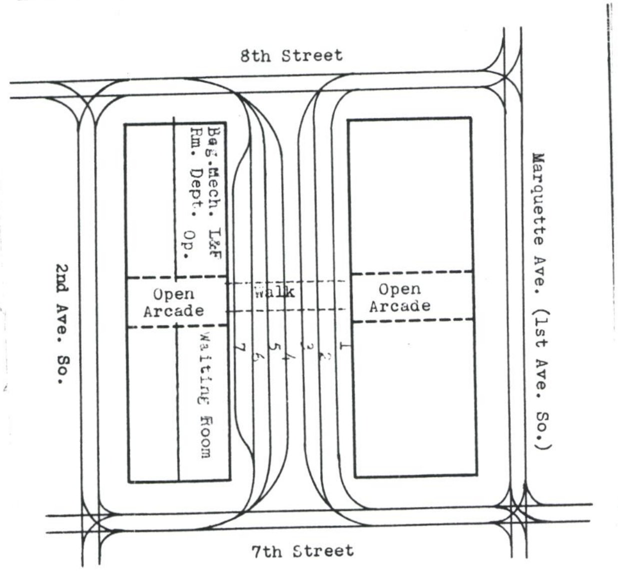
UNION ADDITION DAKOTA COUNTY				
1910	Lots 27 and 28, Block 2			
	" 17 to 26 and 78 to 87, Block 3.		2,500.00	Subn RR Co.

5/5/15

PROPOSED TERMINAL BLOCK
Block 225 Brown & Jackin's Addition
Minneapolis

The Intersection Holding Company was a Minnesota Corporation; Morris T. Baker was president. It owned substantially all the entire common stock of The Baker Building Incorporated of which Morris T. Baker was also president. As of 11-15-1926 the Baker Building and Annex were located on property owned and held under lease by TBBI at 2nd Ave. S. and 7th St. IHC owned property adjacent to TBBI's property consisting of 165 ft. frontage on 7th St. and 99 ft. frontage on Marquette Ave. IHC had three leaseholds on adjoining tracts fronting 231 ft. on Marquette Ave. from 8th St. IHC owed the Rapid Transit Real Estate Corp. $400,000 plus accrued interest at 5% from 5-1-1926 on this property. As of 11-15-1926 an agreement was made whereby IHC would transfer that property and the three leaseholds to TBBI in exchange for a long-term lease from TBBI to IHC and an agreement that TBBI would not issue more than the existing 12,000 common shares in TBBI without consent of IHC until IHC would cease to hold at least one-half of the common shares issued and outstanding. The RTRE Corp. agreed to accept $100,000 in cash plus accrued interest on the unpaid balance, and a Note from TBBI for $300,000 secured by a second mortgage on the property owned by TBBI at 2nd Ave. S. and 7th St. on which the buildings mentioned above were located, subject to a prior encumbrance of $750,000.

TBBI and RTRE Corp. entered into an extension agreement 1-21-1930 to extend to 10-25-1931 the Note dated 10-25-1926 in the amount of $300,000 secured by the second mortgage.



Minneapolis: Proposed Terminal Block, 1915.

RAPID TRANSIT REAL ESTATE CORPORATION
REAL ESTATE APPRAISAL VALUES
JANUARY 1, 1926

Wildwood Park			
South of the right-of-way	6.494 acres	$ 325	
South of the right-of-way	3.603 acres	$ 180	
South of the westbound right-of-way	1.364 acres	$ 68	
West of the right-of-way	6.065 acres	$ 606	
East of the right-of-way	28.780 acres	$2,878	
East of the right-of-way and south of the Powerhouse site	9.003 acres	$5,402	
50 ft. strip from right-of-way to the lake	1.088 acres	$1,500	
	56.397 acres		$10,959
North St. Paul	11 parcels		$ 3,850
Excelsior 3rd St. & Center St. (north of the right-of-way)			$ 600
Total			$15,409

ERJ 8-9-1924

Twin City Rapid Transit Buys Competitor

Suburban Motor Company Taken Over Under Plan for Co-ordination of Lines

The Twin City Rapid Transit Company, Minneapolis, Minn., has purchased the stock and assets of the Twin City Motor Bus Company and on Aug. 1 began to operate buses between Minneapolis and St. Paul and between St. Paul and White Bear Lake, a suburb, under the same conditions, schedules and rates of fare as have prevailed heretofore. The price paid was about $500,000.

This is the most important competitor of the railway between the Twin Cities and between St. Paul and White Bear Lake points. The purchase includes forty buses and the company's headquarters and shops at 164 West Fifth Street, St. Paul. H. L. Bollum, president and manager of the bus company, will continue as manager under the ownership of the railway.

Buses are operated between the Twin Cities on varying schedules according to the time of day and peak loads normally prevailing. The fare is 25 cents between any two points. The fare on the Minneapolis-St. Paul trolley line, which the bus system parallels in the city limits, is 6 cents between any two local points and 12 cents from either city to the other, with transfers. The bus line, being an independent corporation, will not issue nor accept transfers to or from trolley lines.

The bus line is not under supervision of the Minnesota Railroad and Warehouse Commission. That body determines the rates of fare charged on the electric railways.

The Twin City Rapid Transit Company has no present plans to buy other competing interurban bus lines. Neither does it plan to change the equipment on the line it has purchased. That equipment is exceedingly modern and the service is satisfactory to patrons.

NEW MOVE PROBABLY ONLY A START

This purchase is the first step toward consolidation of all the bus service on lines competing with the railway, to be accomplished by some plan not determined. Some of the car lines paralleled by bus service are the Stillwater, Lake Minnetonka, South St. Paul, all suburban lines.

Whether this plan will be accomplished at once or at some future date is not known. Neither is it known whether the plan will involve taking over present bus lines by purchase or installing new bus systems.

In the purchase of the Twin City Motor Bus line the railway has a nucleus for extending bus operation wherever it is feasible. As Vice-President T. Julian McGill explained:

> The purchase of the fleet of buses is in line with the policy of electric railways in other large centers. The motor bus has come to be regarded as an integral part of a modern city transportation system and electric railways have been supplementing their service with fleets of buses. It is felt that one company can better co-ordinate these systems and operate them more efficiently and economically.

Recent Bus Developments

Twin City in Taxi Field

Announcement Made of Cab Purchase at Minneapolis as Further Coordination Move

The Twin City Rapid Transit Company, Minneapolis, Minn., has acquired a majority of the stock and control of the Yellow Cab Corporation of Minnesota. The deal was announced on Dec. 31. It was negotiated through Lane, Piper & Jaffray, Inc., Minneapolis, brokers, and is reported to have involved slightly more than $500,000.

This transaction followed in three days announcement of the formation of the Delaware corporation to merge the Yellow Cab and the Red Top taxi service in the Twin Cities, the Yellow Cab taxi service in Duluth, Minn., the Town Taxi and Drive Yourself services in Minneapolis and Rochester, Minn., which involved about $1,000,000, it was reported at the time.

CO-ORDINATION PLAN ACHIEVED

With the consummation of this deal the Twin City Rapid Transit Company now controls the electric railway service in the Twin Cities area, the interurban bus service and the majority of the taxi service, there being still some independent companies operating. Horace Lowry, president of the company, said:

> The purchase of the control of the taxicab fleet is sound and logical from every standpoint. When we learned that the five companies were consolidated we decided that the next progressive step toward the unification of transportation in the Twin Cities should be taken by us if we were to serve the interests of the public.
>
> We therefore purchased the stock control of the merged companies. Duplication of the organizations and the facilities of the taxi companies has been a source of unnecessary traffic congestion and has not been conducive to the best interests of the public. We are going to do away with this duplication and bind the taxicab business into one sound operating unit, and the Twin Cities may be assured of our utmost efforts toward an improved service which will not be excelled in this country.
>
> While control of the taxicabs in the Twin Cities, together with the ownership of the railway and the bus lines, gives the parent company virtual control of public transportation service, that service is under supervision either by the state or the city. I believe that this unification will best serve the public interest in that it gives more efficient and better service, and I believe further that, given time, we can demonstrate clearly that the transaction is a sound and logical one, and is the ultimate solution of modern transportation difficulties.

CITY IN FRONT RANK

Robert F. Pack, chairman of the board of the newly formed Yellow Cab Corporation, who as head of the Northern States Power Company is familiar with public service operation, said:

> There is no reason why the taxicab business, offering a necessary public service, should not be run on the same high plane with other transportation facilities. The new system established in Minneapolis by this deal puts the city in the front rank of a new transportation development.

Formation of the Yellow Cab Corporation of Minnesota was first reported by way of Chicago on Dec. 13, but was not confirmed in Minneapolis until Dec. 28. P. W. Loudon was announced as president and J. H. Colman as secretary-treasurer. The company has 330 Yellow Cabs and Red Tops, 50 Hertz sedans, 52 Chevrolets, Chryslers and Fords, with 20 new Red Tops ordered.

The new bus corporation already had advanced the taxicab rate 5 cents a mile from 35 cents minimum and 10 cents for each additional half mile with no charge for extra passengers, and was to give the drivers from $2.50 to $4 more wages a week on a commission basis, and had ordered that all of the taxicabs should be completely inclosed.

The merged lines will be reorganized in the near future. In the formation of the new corporation gross earnings of the merged systems for 1925 were given at $1,667,750 and for the twelve months ended June 30, 1926, at $1,632,652. Eight thousand shares of Class A common stock of the new corporation were reported sold at a price of $22.50 and accrued dividend.

It will be recalled that the motor bus subsidiary of the Twin City Rapid Transit Company acquired the Twin City Motor Bus Company line between the Twin Cities in July 1924, the Brown bus line in November, 1925, and the Green bus line in January, 1926, comprising all the interurban passenger bus service and some suburban lines operated out of the city.

Massachusetts Bus Law Upheld by Supreme Court

Statute Found Not to Be Arbitrary or Unreasonable in Its Requirements—Bus Company, Competing with Electric Railway, Cannot Evade Massachusetts Law by Mingling Interstate with Intrastate Passengers

IN A DECISION handed down by Justice Butler the United States Supreme Court on Jan. 3 upheld the validity of the Massachusetts motor vehicle law as applied to buses. The decision affirmed the action of the lower courts in dismissing the suit of the Interstate Buses Corporation against the Holyoke Street Railway and various municipal, county, district and state officials of Massachusetts. The Supreme Court decision, in brief, held that the bus company could not evade the Massachusetts law by mingling interstate with intrastate passengers and that the law is not arbitrary or unreasonable in its requirements.

LOCAL LICENSES REQUIRED

The Massachusetts law requires that buses apply for a license and provides penalties for failure to do so and for operation over routes not approved. The Interstate Buses Corporation runs on regular schedule between Hartford, Conn., and Greenfield, Mass., passing through various Massachusetts towns and cities. Its route for some distance parallels the tracks of the Holyoke Street Railway, the lines of which serve several communities in Massachusetts.

The bus company did not take out a license and a number of its chauffeurs were arrested. The company brought suit to restrain such arrests and to test the Massachusetts law. It relied on the fact that its buses follow an interstate route, claiming that because of this they were not subject to the Massachusetts law. The lower court found that the company did an intrastate passenger business as well as an interstate business, carrying both classes of passengers in the same bus.

The suit was brought to restrain the enforcement of a state statute relating to common carriers of passengers by motor vehicles as in conflict with the commerce clause of the Constitution of the United States and with the due process clause of the Fourteenth Amendment. The case was heard before a court of three judges on an agreed statement of facts, and a final decree dismissing the complaint was entered.

Sections 45, 48 A and 49 of c. 159, General Laws, as amended by c. 280, Acts of 1925, contain the provisions attacked:

No person shall operate a motor vehicle upon a public way in any city or town for the carriage of passengers for hire so as to afford a means of transportation similar to that afforded by a railway by indiscriminately receiving and discharging passengers along the route on which the vehicle is operated, or as a business between fixed and regular termini, without first obtaining a license. The licensing authority in a city is its council, in a town is its selectmen; and, as to public ways under its control, is the metropolitan district commission.

ELECTRIC RAILWAY OBJECTS

No person shall operate a motor vehicle under such license unless he has also obtained from the Department of Public Utilities a certificate that public convenience and necessity require such operation. Any one operating under a license from local authority and a certificate from the department is declared to be a common carrier and subject to regulation as such. Violations of Secs. 45-48 or of any order, rule or regulation made under them are punishable by fine or imprisonment or both. And the act gives to the Supreme Judicial and Superior Courts jurisdiction in equity to restrain any violation upon petition of the department, any licensing authority, ten citizens of a city or town affected by the violation, or any interested party. Neither license nor certificate is required in respect of such carriage as may be exclusively interstate.

For many years the appellee, the

YELLOW CAB CORPORATION OF MINNESOTA
(A Delaware Corporation)

Advertisment 12-30-1926

New issue: 8,000 shares of Class A Common Stock. Preferred over Class B Common Stock as to Assets and Dividends, but subject to right of 7% Preferred Stock, if any, outstanding.

Will own or control these subsidiary companies:
Not less than 90% of Yellow Cab Company Inc.. (Minneapolis, St.Paul)
Not less than 90% of Preferred and Common Stock of Red Top Cab Company
(organized 1923). (Minneapolis and St.Paul)
Yellow Cab Company of Duluth.
100% of Town Taxicab Company Inc. (organized 1925). (Minneapolis, Rochester)
100% of Drive Yourself System Inc. (Minneapolis, Rochester)

These services operate:
330 Yellow and Red Top taxicabs;
50 Hertz Ambassador Sedans used in the taxicab and drive yourself operations;
52 Chevrolet, Ford and Chrysler automobiles used in drive yourself operation.

Management: R. F. Pack, Chairman of the Board of Yellow Cab Corp. of Minn.; P. W. Loudon, President; J. H. Colman, Secretary and Treasurer.

Upon completion of the present financing:	Authorized	Outstanding
6% Serial Gold Notes	$250,000	$250,000
7% Preferred Stock ($100 par value)	10,000 shares	none
Class A Common Stock (no par value)	30,000 shares	23,529 shares
Class B Common Stock (no par value)	60,000 shares	48,529 shares

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Twin City Rapid Transit Company purchased:
1-04-1927 Cert. #1 Yellow Cab Corp. of Minn. 15,000 shares Class A Common
1-04-1927 Cert. #1 Yellow Cab Corp. of Minn. 30,000 shares Class B Common
8-18-1927 10 Minnesota 6% Equipment Trust Gold Notes @ $500 each
8-18-1927 110 Minnesota 6% Equipment Trust Gold Notes @ $1000 each

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ERJ 1-19-1929

Taxis Sold by Twin City Rapid Transit

The Yellow Cab Company, for two years a subsidiary of the Twin City Rapid Transit Company, Minneapolis, Minn., operating 300 taxicabs in the Twin Cities and Duluth, Minn., has been taken over by a new company headed by Paul W. Tibbetts, of the Twin City & Southern Bus Company. An unusual feature is that two well-known women of Minneapolis are on the new board of directors. Among the other members of the board are C. E. Wickham, president of the Northland Transportation Company, bus operator for the Great Northern Railroad; John Junell, attorney for the Twin City Rapid Transit Company; Ivan Bowen, former member of the Minnesota Railroad & Warehouse Commission and counsel for a bus company, and C. B. Goodsell, who has operated the Yellow Cab Company for the street railway.

T. Julian McGill, vice-president of the Twin City Rapid Transit Company, indorsed the statement by Mr. Tibbetts that, when the Twin City Company bought all the larger taxicab companies, the intention was to put operation of transportation facilities under one directing head, but it was found the taxicab business was not essentially a competitor of street railway service. "Furthermore," said Mr. Tibbetts, "due to a chaotic condition of the taxi situation in the city, it involved attention, effort and financial hazard out of all proportion to the value of the service as an auxiliary to the railway business."

◆

GENERAL RULES

These rules are hereby approved, and shall govern all employees of "Twin City Lines."

This section shall form the first part of each Department Rule Book.

HORACE LOWRY,
President

February 1, 1916

GENERAL RULES

These rules are hereby amended so that the words "Vice President" shall be construed as meaning "President."

HORACE LOWRY,
President.

February 1, 1916.

General Rules

INTRODUCTION.

The object of these rules is the betterment of the service rendered by the Twin City Lines, and the guidance of all concerned in the performance of their duties. The safe and prompt operation of cars and the comfort and convenience of patrons are of the first importance.

ORGANIZATION.

Twin City Rapid Transit Company, a New Jersey corporation, is a holding company owning substantially all of the capital stock of the following subsidiary corporations, commonly known as "Twin City Lines":

1. Minneapolis Street Railway Company owns and operates the local street railway lines in the city of Minneapolis.
2. The Saint Paul City Railway Company owns and operates the local street railway lines in the city of St. Paul.
3. The Minneapolis and St. Paul Suburban Railroad Company owns and operates suburban lines of electric railroad, among which are the, so-called, Lake Minnetonka, Deephaven, White Bear, Stillwater, South St. Paul, St. Louis Park and Robbinsdale lines, all of which connect and operate in conjunction with the above mentioned local street railway systems in Minneapolis and St. Paul. This corporation also owns and operates terminal docks at Excelsior and at Wildhurst on Lake Minnetonka.
4. The Minnetonka and White Bear Navigation Company owns and operates steamboats on Lake Minnetonka, owns and operates Wildwood Park on White Bear Lake, also owns certain property on Big Island and property adjacent to Tonka Bay at Lake Minnetonka.
5. The Transit Supply Company was organized for the purpose of acting as a purchasing, stores, and fiscal agent for the Companies included in paragraphs 1 to 4, inclusive, and as such to provide a convenient medium through which accounts, common to all four Companies, might be properly adjusted and cleared.

The words "Company" or "The Company," as used in these rules, shall mean and embrace any one or all of the associated Companies of "Twin City Lines."

EMPLOYEES.

Any employee whose time is devoted exclusively to one of the above Companies shall be considered an employee of that Company. Employees may be called upon at any time to work for any one or all of the Companies, and when so engaged shall be considered as employees of the Company or Companies to which their time is devoted.

Re-Employment. No employee or former employee of one department shall be employed in any other department without the approval of the head of that department in which the individual was last employed.

Employment of Minors. No minor shall be employed without the written consent of his parents or guardian. A suitable record of all cases of such employment shall be kept on standard printed form.

Garnishee and Debts. Employees who fail to pay their just debts, or whose wages have been garnisheed, may be dismissed from the service unless satisfactory explanation is given.

OFFICERS.

The Company shall have the following General Officers and Department heads:

President
Vice President
Second Vice President
Third Vice President
Secretary
Treasurer
Auditor
General Counsel
General Superintendent
Division Superintendents
Superintendent of Employment
Superintendent of Schedules
Claim Agents and Attorneys
Engineer of Power and Equipment
Engineer of Maintenance of Way
Master Mechanic
General Passenger Agent
General Storekeeper
Superintendent of Parks

Responsibility The line of responsibility of each office and head of department is indicated by the following Organization Chart:

The President shall preside over and direct all other officers of the various Companies represented. He shall dictate the policy, and authorize the method of procedure in conducting the business affairs of the system, and exercise other ruling functions. He shall act as chairman of all stockholders' and directors' meetings, and be the chief executive officer of each corporation.

The Vice President shall act in place of and for the President in directing the management and conduct of the business of the several Companies represented in the system, and shall have authority in determining the issues involved.

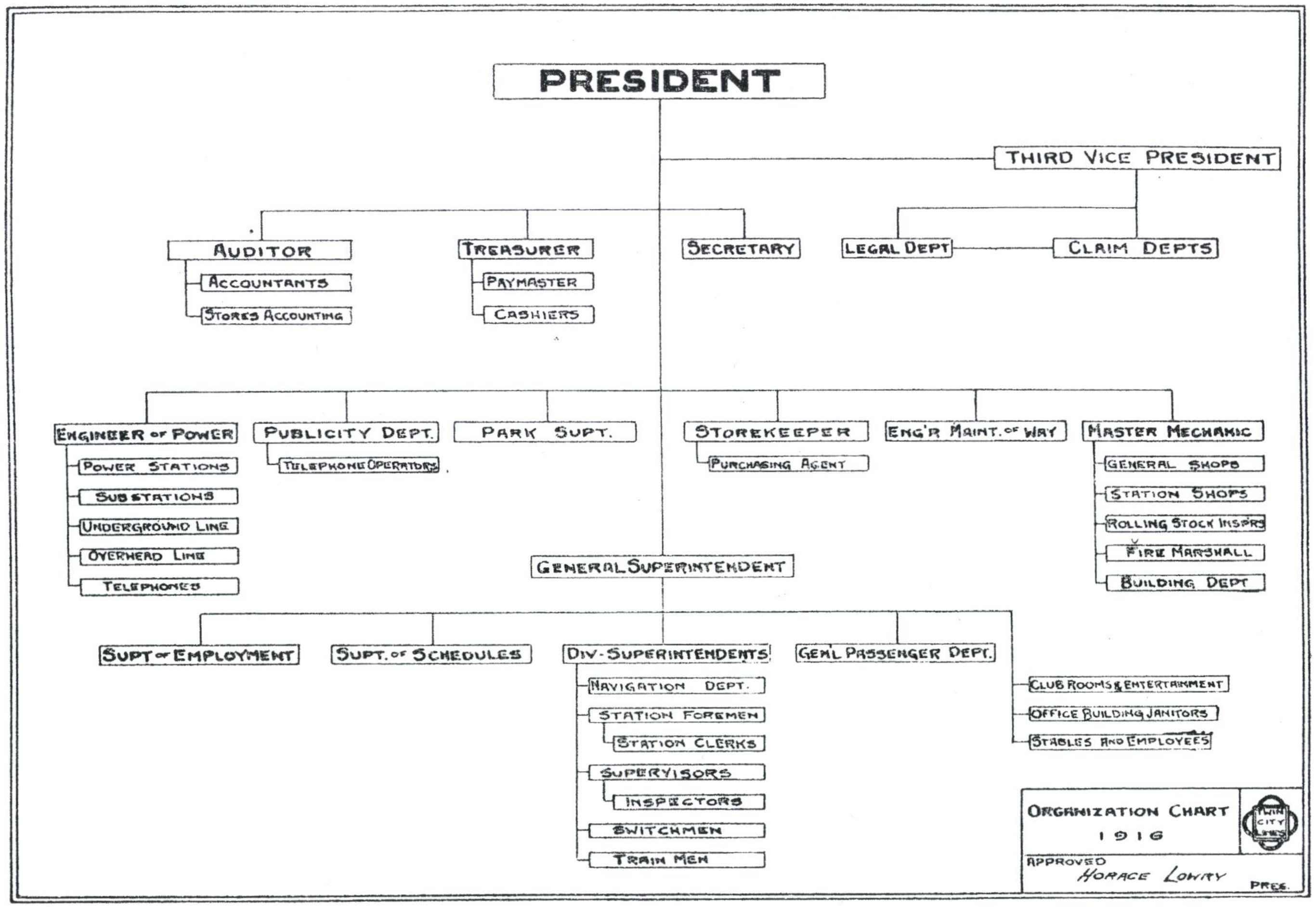
The Second Vice President shall act only in the absence of both the President and Vice President in discharging the duties and functions of his office.

The Third Vice President shall have charge of the Claim Departments of the several Companies associated, and direct the legal counsel in matters pertaining to questions at issue. He shall be the representative of the various Companies in all tax matters, and have charge of other business as directed and commissioned by the President.

The Treasurer has charge of all moneys received, and is responsible for the disbursement of same on approved vouchers.

The Auditor is in charge of all accounting and auditing.

The General Counsel is in charge of the Legal Department.


PRESIDENT
THIRD VICE PRESIDENT
AUDITOR
ACCOUNTANTS
STORES ACCOUNTING
TREASURER
PAYMASTER
CASHIERS
SECRETARY
LEGAL DEPT
CLAIM DEPTS
ENGINEER OF POWER
POWER STATIONS
SUBSTATIONS
UNDERGROUND LINE
OVERHEAD LINE
TELEPHONES
PUBLICITY DEPT.
TELEPHONE OPERATORS
PARK SUPT.
STOREKEEPER
PURCHASING AGENT
ENG'R MAINT. OF WAY
MASTER MECHANIC
GENERAL SHOPS
STATION SHOPS
ROLLING STOCK INSP'RS
FIRE MARSHALL
BUILDING DEPT
GENERAL SUPERINTENDENT
SUPT OF EMPLOYMENT
SUPT. OF SCHEDULES
DIV-SUPERINTENDENTS
NAVIGATION DEPT.
STATION FOREMEN
STATION CLERKS
SUPERVISORS
INSPECTORS
SWITCHMEN
TRAIN MEN
GEN'L PASSENGER DEPT.
CLUB ROOMS & ENTERTAINMENT
OFFICE BUILDING JANITORS
STABLES AND EMPLOYEES
TWIN CITY LINES

ORGANIZATION CHART
1916

APPROVED
HORACE LOWRY
PRES.

The General Superintendent has charge of all matters affecting the train and boat service.

The Division Superintendents, in their respective divisions, are the representatives of the General Superintendent.

The Superintendent of Employment is responsible for employing and training men for the train service.

The Superintendent of Schedules has charge of the preparation of all time cards.

The Claim Agents and Attorneys are in charge of all matters affecting claims for injuries and damages.

The Engineer of Power and Equipment is responsible for all matters pertaining to the generation and distribution of electrical power.

The Engineer of Maintenance of Way is responsible for the construction, maintenance and care of all tracks, roadbed, and appurtenances thereto, including right-of-way, bridges, fences and docks.

The Master Mechanic is responsible for the construction and maintenance of all buildings (except those of the Power and Equipment Department), rolling stock, and all equipment and appliances in connection therewith.

The General Passenger Agent is in charge of all advertising and publicity, supervises the telephone system, and attends to all complaints. He also makes arrangements for chartered cars and boats, subject to the approval of the General Superintendent.

The General Storekeeper is in charge of supplies and storehouse stock, and acts as Purchasing Agent.

The Superintendent of Parks has charge of all amusement resorts operated by the Company. He also has charge of all Trainmen's Club Rooms.

AUTHORITY OF DEPARTMENT HEADS.

The Department Heads are responsible directly to the Vice President for the proper conduct of their respective departments, and their decisions regarding their departmental matters, subject only to his approval, shall be final. This includes authority to discharge employees under them. Matters pertaining to changes in the force of employees, and the fixing and changing of rates of pay shall be referred to the Vice President for approval.

RECORDS OF EMPLOYEES.

Every Department shall keep a complete record of all employees of that department on cards provided for this purpose. These cards shall contain information concerning the employee, such as name, address, date of appointment, position, age, rate, and all changes.

If employee leaves the service, the date and reason for leaving shall be entered, and the card retained.

CONTRACTS.

All contracts, agreements, etc., having relation to and involved in the purposes for which The Transit Supply Company was organized, shall be made in the name of that Company. All other contracts may be made in the name of the proper operating or constituent Company. Contracts, agreements, etc., when duly approved, shall be executed by the President or Vice President.

Any changes in contracts and agreements must have the approval of the President or Vice President.

The originals of all contracts, agreements, and changes therein, must be sent to the Auditor as promptly as possible. Copies of same shall be furnished the General Storekeeper and the Department concerned.

ROUTINE.

General.

All reports, recommendations, suggestions, criticisms and other matters affecting or relating to the Company's business shall be brought to the attention of the Department Head by his subordinates and such Head of Department will be held responsible for forwarding same to the proper authority for such attention as the importance of same may warrant.

There must be no "short circuiting" of authority.

Quotations and Proposals.

Whenever purchases are to be made, property sold, or work done by an outside concern, the necessary bids and proposals shall be obtained by the General Storekeeper, to whom shall be given all necessary information by the Department Head concerned. The General Storekeeper shall refer all such prices and quotations to the Department Head for his consideration and further action.

Requisitions and Authorizations.

All supplies and materials to be purchased shall be first covered by Requisitions. All work or new construction to be done involving an expenditure of less than Two Hundred Dollars shall be first covered by Requisition. If, however, the expense involved is Two Hundred Dollars, or more, it shall be first covered by an Authorization, accompanied by detailed estimate.

All Requisitions and Authorizations must be signed by the Department Head concerned, or in his absence, by his duly authorized representative.

Requisitions should state when delivery of goods is desired. General Storekeeper shall advise Department concerned when this delivery cannot be made.

Requisitions for office supplies should be made on the first of each month.

Requisitions pertaining to all departments, except the Claim Department, shall be sent to the Office of the Vice President for approval.

Requisitions pertaining to the Claim Department or to Taxation shall be sent to the Third Vice President for approval.

All Authorizations shall be sent to the Office of the Vice President for approval.

Information.

Detailed information regarding Company affairs, and in particular cost figures, shall not be given to persons outside the organization, except with the approval of the President or Vice President.

Forms.

All new forms, changes in existing forms, and the reprinting of existing forms require the approval of the Department Head concerned as to subject matter, as well as the approval of the Auditor as to quality and size of paper.

New forms and changes in existing forms must be referred to the Office of the Vice President for approval.

AUTHORITY OF STATION FOREMEN IN EMERGENCIES.

In any emergency, such as fire, accident or severe storm, necessitating extra or unusual work in the handling of equipment, all employees at car stations shall look to the Station Foreman of the Operating Department for instructions.

OPERATION OF EQUIPMENT.

Passenger Cars.

No passenger equipment shall be operated or used by any department except the Operating Department unless such use is approved by the General Superintendent.

Wrecker No. 21.

Except in cases of emergency, Wrecker No. 21 shall not be called for or used by any department other than the Operating and Mechanical departments, without the Vice President's approval.

Service Cars.

Only Company employees shall be allowed on service cars.

Only regularly employed motormen, or employees who have qualified as such and have received the approval of the Operating Department, shall be allowed to operate service cars.

In the operation of service cars the regular rules of the Operating Department shall apply and the motormen on duty with service cars shall be governed accordingly, except that with regard to work to be performed they shall be under the direction and orders of the Foreman or Superintendent of the department performing the work at hand.

Emergency Operation.

When weather conditions, or travel, or other conditions make it necessary to adopt measures to relieve the power stations, upon receiving notice from the General Superintendent, the service equipment of all departments shall be kept off the lines between 5:30 P. M. and 6:30 P. M.

TIME.

Hours.

The hours of service in the General Office buildings in Minneapolis and St. Paul, and at the Storehouse, shall be 8:00 A. M. to 12:00 Noon and 1:00 P. M. to 5:00 P. M. On Saturdays from 8:00 A. M. to 12:00 Noon.

However, office employees may be required on special occasions to work longer hours without extra compensation.

The hours of other employees shall be those decided on from time to time by the Department Heads.

Illness.

In case of illness which prevents an employee from reporting for duty, he shall notify his immediate superior as soon as possible.

Allowance of Time.

When an employee for any reason is absent from his duties, no time shall be turned in by the Timekeeper during such absence.

If an Operating Department employee is absent for any length of time due to injury received while in the Company's service, a request for allowance of time shall be made to the Third Vice President, stating the case, and must be accompanied by requisition for Claim Department voucher to cover time so lost. This requisition shall state plainly that voucher is in payment for lost time resulting from injury. Accident report number must be given. Except in very unusual cases, employees of all departments, except the Operating Department, shall be settled with according to the terms of the Workman's Compensation Act of this State.

If an employee working on hourly basis, or an employee working on monthly basis who is not on special list covered in next paragraph, is absent for one day or less and Department Head wishes to allow time, a written request shall be made to the Auditor, with copy to the Vice President. This time shall be allowed on payroll. If time exceeds one day, requests should be made to the Vice President and should be accompanied by requisition for amount of pay.

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Special Employees.

Each Department Head shall forward to the Vice President a list in duplicate of employees in his department who are on the monthly roll, and whose services are of such a nature that their value to the Company is not entirely determined by the actual hours of service. Report must be made promptly of any changes in this list. Department Heads are authorized to recommend payment for time lost in the case of absence of any employee on this list for a period not in excess of one month. If the employee is a member of the Employees' Mutual Benefit Association, the recommendation should be for the difference between full time and the benefits received from the Association. If the employee is not a member of the Association, the recommendation may be for full time. Recommendations in these cases shall be by letter to the Auditor, with copy to the Vice President, covering allowances for absence not in excess of three days, and by letter to the Vice President with full explanation, accompanied by requisition, for absence in excess of three days and not more than one month.

All allowances of time, except allowances made on payroll, shall be considered as donations to employees and requisitions shall be so worded.

At the end of every payroll period, Department Heads shall notify the Auditor regarding all employees who are then absent, and for whom time is not regularly reported.

Request shall not be sent in until the employee has actually returned to work, and must then be forwarded at end of payroll period by the Department Head concerned.

TIMEKEEPERS.

General.

Timekeepers of all departments shall report time to the Auditor.

Foremen in charge of crews shall report to the Timekeeper the actual time employees are on the work, and not the amount of time to be allowed. Employees who make time sheets shall always show the actual time on the work, except when transferred from one place to another during working hours. In this case the time for transferring shall be divided between the two places as nearly as practicable.

Timekeepers shall assist the General Foremen, and Superintendents of the different departments in every way possible, and shall call their attention to all irregularities in requests for time allowances made by the foremen.

Timekeepers must have written instructions for any allowance not covered by these rules.

All discrepancies in doubtful cases shall be decided by the Department Head concerned.

Monthly Employees.

Employees who receive compensation on a monthly basis are expected to work overtime and to perform Company work whenever called upon, without extra compensation.

Motormen and Trolley-holders.

Motormen and trolley-holders on service cars shall be allowed the actual time as shown on service car report, duly approved by the Station Foreman of the Operating Department. If, however, a motorman on service car has been previously assigned to a regular run in the passenger service and is operating the service car temporarily, he shall be allowed the total time of his regular run in the passenger service if such time exceeds the time on service car.

Adjustment of fractional hours shall be made on the last day of payroll period.

PAYROLLS.

Payrolls shall be closed on the fifteenth and last day of each month, the payroll periods being approximately the first half and the last half of each month.

Employees shall be paid by The Transit Supply Company on the twenty-fifth day of each month for the first payroll period, and on the tenth day of the succeeding month for the second payroll period.

Accommodation Checks. In deserving cases employees may obtain their pay before the regular pay-day by presenting at the Treasurer's Office an Accommodation Check, duly signed by Department Head concerned, and approved by the Office of the Vice President.

HOLIDAYS.

As far as practicable the following Holidays will be observed:

New Year's Day
Washington's Birthday
Memorial Day
Fourth of July
Thanskgiving Day
Christmas Day

VACATIONS.

Office and Storehouse employees who have been in the employ of the Company for one year are entitled to two weeks' vacation with full pay.

Other department employees may be given such vacations as may be decided upon by the Department Heads, and approved by the Vice President.

All vacations must be taken at times approved by the Department Head.

ACCIDENTS.

It shall be the duty of all employees of the Company to do their utmost to prevent accidents, and to render every possible assistance in case of an accident.

Immediate notification of all accidents must be given to the Claim Department.

In case of accident to an employee, the injured person, if able to travel, may be sent to the Company physician, whose office is at Snelling. If the injury is too serious to admit of traveling, an outside physician shall be called.

In all cases of accident, written reports must be promptly made upon blanks furnished for that purpose. The information given shall be as complete as possible regarding date, time, place, nature and cause of accident, together with names and addresses of persons concerned and of as many witnesses as possible. The facts should be stated fully and accurately, whether favorable or unfavorable to the Company. These reports shall be made to the Claim Department through the office of the department concerned.

FREE TRANSPORTATION.

Employee Car Tickets (Form 7) shall be issued only to employees for the purpose of traveling on Company business.

An employee riding on a badge must have his badge on his hat before boarding car and must not remove same while on the car. Such employees are prohibited from smoking on passenger cars.

RIDING ON PLATFORM.

Employees riding on badges must ride inside of car and not occupy seats when paying passengers are standing. However, when carrying large and bulky tools they will be permitted to ride on rear platform.

Employees shall not ride on front platform of passenger cars except when furnished with written permit signed by the General Superintendent. When using such permit, employees shall refrain from interference or unnecessary conversation with the motorman.

LOST BADGES.

When an employee loses a Company badge, either Twin City Lines badge or trainman's badge, the Head of his Department shall notify the Auditor in writing, with a copy to the Vice President, and a deduction of $10 shall be made from the employee's next pay check. If the badge is lost in the performance of duty through no fault of the employee concerned, the Department Head may at his discretion recommend to the Vice President that the employee be reimbursed for the amount deducted from his pay check. Such letter shall be accompanied by the necessary requisition. This reimbursement, however, shall not be made until after proper deduction has been made for the lost badge.

GRATUITIES, FEES AND PRESENTS.

No employee of the Company shall be allowed to receive gratuities, fees, or presents of any description from business houses, individuals, patrons of the lines, or other employees.

The single exception to this rule is that a patron of the lines, who recovers a lost article, may make a present to the trainman finding same and turning it in.

RECOMMENDATIONS.

Letters of recommendation in behalf of past or present employees shall be issued only by Department Heads.

SOLICITORS.

No solicitors, book agents, etc., will be allowed in any of the buildings of the Company. No one will be permitted to enter the buildings or property of the Company for the purpose of circulating petitions of any description, or for the purpose of selling wares or distributing advertisements.

SUMMONS AND COMPLAINT.

Summons and Complaint, when served on any officer of the Company, shall be promptly transmitted to the Claim Agent, who shall then be held responsible for any further attention to the matter.

12-31-1926
Data

General Description of the Property

Twin City Rapid Transit Company owns and controls all operating properties of the following companies contributing to the electric railway and bus service in the cities of Minneapolis, St. Paul and Stillwater, with branch lines rendering service to municipalities tributary to these cities:

Minneapolis Street Railway Company
The St. Paul City Railway Company
The Minneapolis & St. Paul Suburban Railroad Company
The Minnetonka & White Bear Navigation Company
The Rapid Transit Real Estate Corporation
The Twin City Motor Bus Company

These properties include a total of 504.53 miles of single track, land held by The Rapid Transit Real Estate Corporation for future development, and 109 passenger motor buses and 7 service buses. Track mileage owned and operated is as follows:

Minneapolis Street Railway Company	237.492	
Fort Snelling Line	4.453	
TOTAL—Minneapolis Street Railway Company		241.945
The St. Paul City Railway Company		171.234
The Minneapolis & St. Paul Suburban Railroad Company:		
Minnetonka Line	43.099	
Columbia Heights Line	1.544	
Robbinsdale Line	1.846	
St. Louis Park Line	2.103	
Stillwater Line	27.719	
White Bear Line	4.466	
Mahtomedi Line	1.795	
South St. Paul	8.780	
TOTAL—The Minneapolis & St. Paul Suburban Railroad Company		91.352
GRAND TOTAL		504.531

Minneapolis Street Railway Company:

Minneapolis Street Railway Company operates the entire street railway system located within the corporate limits of the City of Minneapolis comprising 241.945 miles of single track. It owns all of this operated property except for the so-called Harriet Right of Way owned by The Minneapolis and St. Paul Suburban Railroad Company extending from the easterly line of Hennepin Avenue at 31st Street to the westerly city limits of Minneapolis at South France Avenue, comprising 5.9 miles of single track. The Minneapolis Street Railway Company also owns and operates the so-called Fort Snelling Line, comprising 4.45 miles of single track located on the United States Government Reservation extending from the southerly city limits of Minneapolis to the St. Paul city limits in the middle of the bridge over the Mississippi River. It also operates the so-called Columbia Heights Line owned by The Minneapolis & St. Paul Suburban Railroad Company, comprising 1.5 miles of single track located outside of the northerly city limits extending along Central Avenue and 37th Avenue North to 40th Avenue North and thence on 40th Avenue North to North 5th Street.

Minneapolis Street Railway Company owns seventeen parcels of land on which are situated the car house, office, power station and substation buildings; has about 181 miles of paved track, of which a large proportion is granite block paving; a power distribution and transmission system consisting of overhead trolley with iron poles, feeder lines, underground conduit and transmission lines; 43 buildings comprising general office building, power and substation buildings, car houses and miscellaneous buildings; a steam turbine power station of 75,000 K.W. capacity supplying power for the operation of the Minneapolis, St. Paul and Suburban systems augmented by the purchase of water power from the St. Anthony Falls Water Power Company generated from what is known as the Lower Dam water power station, having a capacity of 7,000 K.W., and the Hennepin Island water power station, having a capacity of 9,000 K.W.; six rotary converter substations; furniture and fixtures, tools, automobiles, etc. The rolling stock of the entire Twin City System comprises 1,021 passenger cars and 86 service cars of which the Railroad and Warehouse Commission allocated 62.33% of their total value to the Minneapolis Street Railway Company, 35.15% to The St. Paul City Railway Company and 2.52% to The Minneapolis & St. Paul Suburban Railroad Company.

The St. Paul City Railway Company:

The St. Paul City Railway Company operates the entire street railway system located within the corporate limits of the City of St. Paul comprising 171.234 miles of single track, and a large portion of which is paved with granite block on a concrete base; also a line to South St. Paul comprising 8.78 miles of single track owned by The Minneapolis & St. Paul Suburban Railroad Company. This latter Company also owns the line within the corporate limits of the City of St. Paul on East 7th Street extending from Duluth Avenue to the city limits, comprising 5.09 miles of single track, although the line is operated by The St. Paul City Railway Company. In addition to the tracks the property principally consists of the Selby Tunnel; seven parcels of land on which are located the general office, car station, substation and shop buildings; the power distribution and transmission system consisting of overhead trolley mostly supported by iron poles, feeder lines, underground conduit with transmission and distribution cables; four rotary converter substations having an aggregate capacity of 20,400 K.W., all primary power being supplied by the Minneapolis Street Railway Company and the St. Anthony Falls Water Power Company; 37 office, shop, substation, car house and miscellaneous buildings; shop machinery and shop tools; furniture, automobiles, etc. As before stated the Railroad and Warehouse Commission allocated 35.15% of the value of all of the rolling stock on the Twin City System comprising 1,021 passenger cars and 86 service cars as the property of The St. Paul City Railway Company.

The Minneapolis & St. Paul Suburban Railroad Company:

The Minneapolis and St. Paul Suburban Railroad Company comprises a total of 91.352 miles of single track with the necessary overhead lines located largely on private right of way and rendering service to the Lake Minnetonka, White Bear Lake and Stillwater communities and in addition giving service to suburban towns bordering on the Cities of Minneapolis and St. Paul. There are three principal divisions of the property known as the Stillwater Division, the Minnetonka Division and the Local Suburban. The Stillwater Division serves the cities and villages of North St. Paul, Wildwood, Stillwater, Bayport, White Bear and Mahtomedi. The Minnetonka Division serves the cities and villages of Hopkins, Excelsior, Tonka Bay and Deephaven. Local suburban lines owned by the Company serve the cities and villages of South St. Paul, Columbia Heights, Robbinsdale and St. Louis Park. The lines are all high speed lines of most modern type of construction with large quantities of grading work. Bridges, viaducts, subways and culverts are quite extensive on the lines. The track is well ballasted. All primary power is purchased from the Minneapolis Street Railway Company. There are two main substations and one terminal substation on the Stillwater Division, also on the Minnetonka Division. The Company also owns a number of buildings and waiting stations.